Metals Review

The News Digest Magazine of Metal Production and Metal Working

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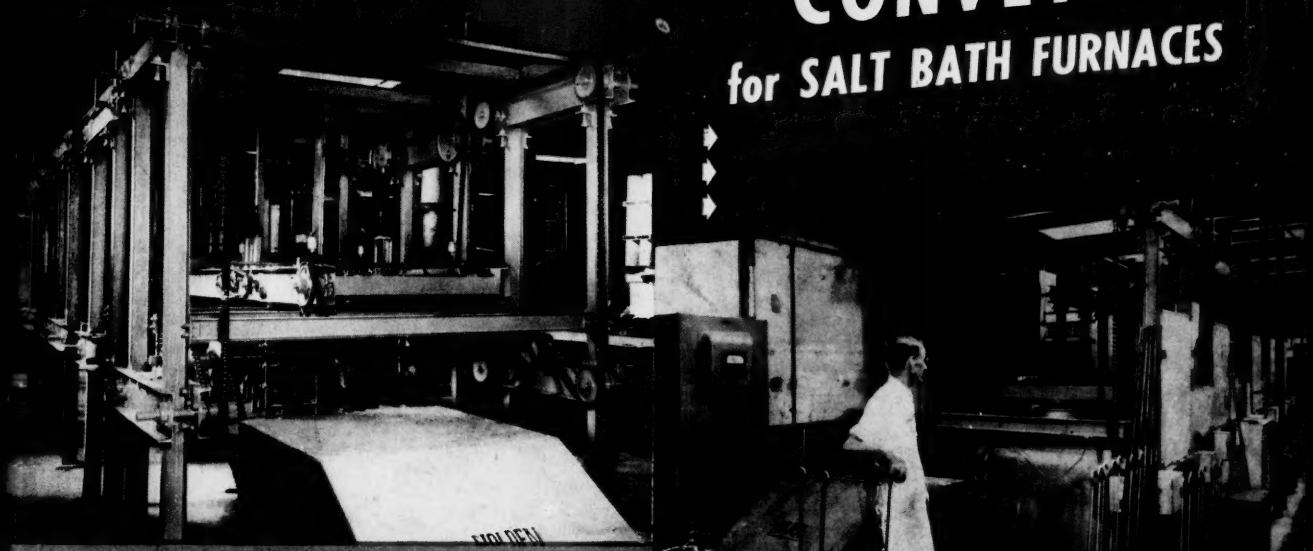
Metal Working Issue

VOLUME XXI—No. 3 MARCH, 1948

HOLDEN PREFABRICATED CONVEYORS for SALT BATH FURNACES



APPLICATIONS

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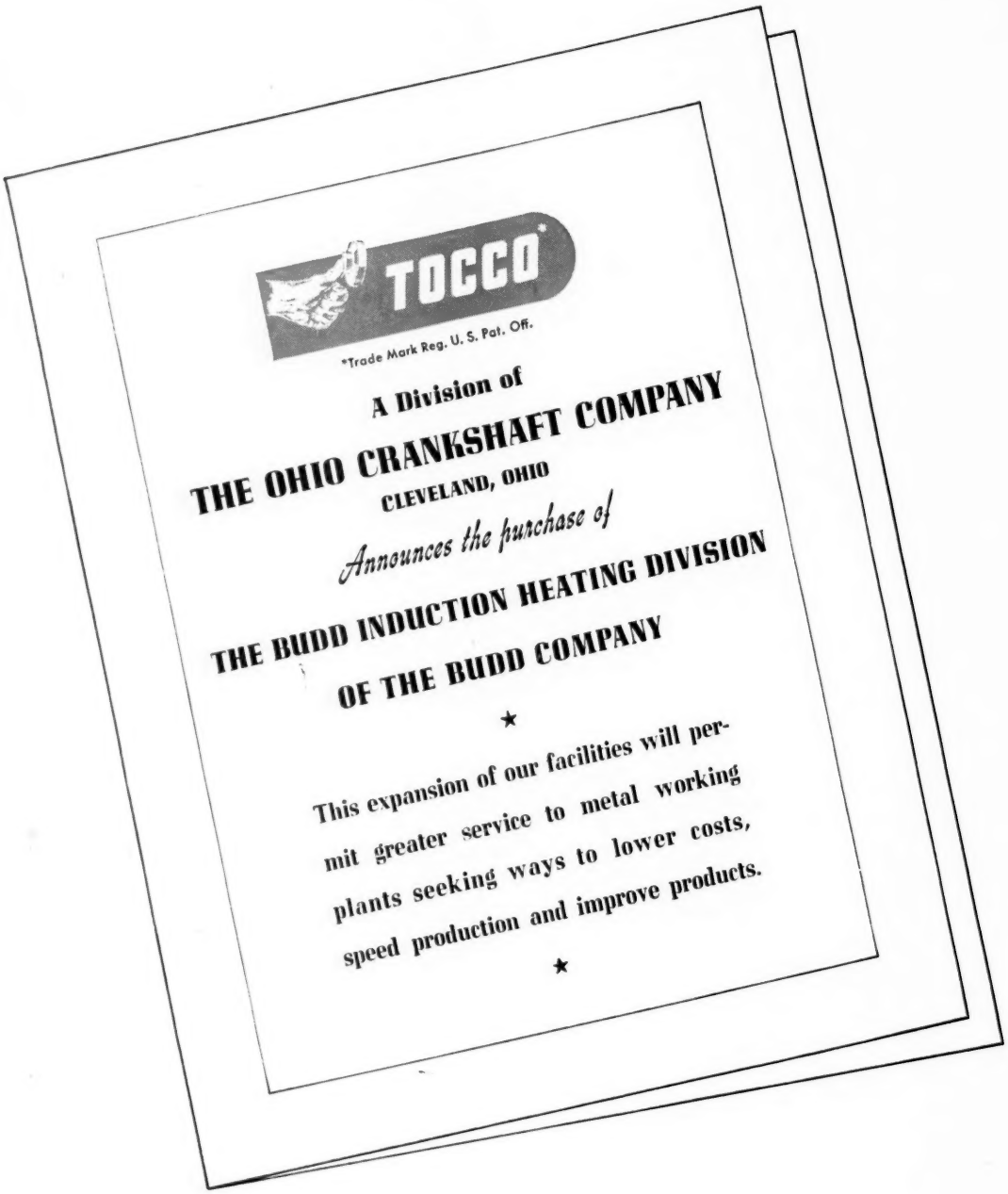
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Metals Review

The News Digest Magazine of Metal Production and Metalworking

RAY T. BAYLESS, Publishing Director — MARJORIE R. HYSLOP, Editor — GEORGE H. LOUGHNER, Production Manager

VOLUME XXI NO. 3 — MARCH, 1948

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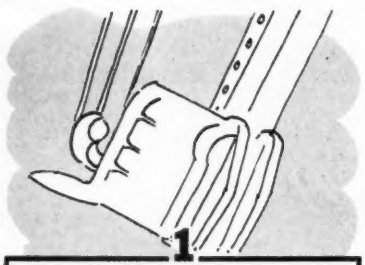
A. S. M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad, Received in the Library of Battelle Memorial Institute, Columbus, Ohio, During the Past Month



1 ORE BENEFICIATION

1a—General

1a-4. Effects of Oxidation of Sulphide Minerals on Their Flotation Properties. Enid C. Plante and K. L. Sutherland. *Mining Technology*, v. 12, Jan. 1948, T. P. 2297, 29 pages.

Reports investigations of above with particular reference to adhesion of air bubbles to the mineral. 36 ref.

1a-5. Flotation of Unoxidized and Oxidized Sulphide Minerals—Antimonite, Arsenopyrite, Covellite, Lollingite, Marcasite, Orpiment, Pyrrhotite and Tetrahedrite. Enid C. Plante. *Mining Technology*, v. 12, Jan. 1948, T.P. 2298, 15 pages.

Uses captive bubble and cylinder flotation tests to study the response of above minerals to ethyl xanthate as a collector.

1a-6. Mineral Dressing. J. F. Myers. *Mining and Metallurgy*, v. 29, Feb. 1948, p. 80-86.

1947 developments.

1a-7. How American Industry Uses Magnetic Separators. *Flow*, v. 3, Feb. 1948, p. 36-41.

The four primary functions include removal of tramp metal, concentration, purification, and reclamation. A list of points is included as a guide to choice of the correct type for a given product and process.

1a-8. Research and Development Open New Phase in Milling. R. H. Ramsey. *Engineering and Mining Journal*, v. 149, Feb. 1948, p. 104-109.

1947 developments.

1a-9. Physical Chemistry of Flotation. XI. Kinetics of the Flotation Process. K. L. Sutherland. *Journal of Physical & Colloid Chemistry*, v. 52, Feb. 1948, p. 394-425.

An investigation of the direct-encounter hypothesis for adhesion of mineral to bubble. Several theoretical conclusions were reached. However, the equation derived for variation of flotation rate with mineral size, under continuously operating conditions, fails to predict the uniform flotation rate which has been found by some authors at small sizes. The possibility of flocculation of particles is discussed. 28 ref.

1b—Ferrous

1b-2. Mount Andrew Iron Deposit, Kasaan Peninsula, Prince of Wales Island, Southeastern Alaska. W. S. Wright and A. W. Tolonen. *Bureau of Mines, Report of Investigations* 4129, Nov. 1947, 27 pages.

Location, deposits, ores, and sampling results. Two samples contain about 0.7% Cu and 50% Fe, and 58.3% Fe and only 0.05% Cu. Beneficiation and suggested flow sheets. A copper concentrate can be recovered from the first ore. Steps include milling, classifying, flotation, magnetic separation, filtering, thickening, and sintering.

1b-3. Investigation of the Iron-Bearing Formation of the Western Gogebic Range, Iron County, Wis. Paul Zinner and Clyde L. Holmberg. *Bureau of Mines, Report of Investigation* 4155, Dec. 1947, 48 pages.

Results of magnetic concentration of magnetic fraction; magnetic concentration following a reducing roast in a hydrogen atmosphere; screen analyses; flotation of crude-ore samples; gravity concentration and gravity concentration followed by flotation; and combined magnetic flocculation, elutriation, and flotation. Also includes a description of the deposits and the ore, and results of sampling and analysis.

1b-4. Mesabi Taconite. Papers Presented at the 1945 Mining Symposium. *Mines Experiment Station, University of Minnesota, Information Circular* No. 5, Sept. 1945, 40 pages.

Consists of the following papers: Geological Description of the Mesabi Range Taconites, by Stephen Royce; Leasing and Administration of State Mineral Lands, by Ray D. Nolan; Taconite Mining—Past and Future, by R. W. Whitney; Present-Day Grinding Practice, by O. H. Johnson; Beneficiation of Eastern Mesabi Magnetic Taconite, by E. W. Davis; Methods of Agglomeration and the Problem of Agglomerating Fine Taconite Concentrates, by M. F. Morgan.

1b-5. Iron Ore Beneficiation Shows Healthy Growth. Francis X. Tartaron. *Engineering and Mining Journal*, v. 149, Feb. 1948, p. 110-113.

1947 developments.

1c—Nonferrous

1c-3. Investigation of the Mount Eielson Zinc-Lead Deposits, Mount McKinley National Park, Alaska. Neal M. Muir, Bruce I. Thomas, and Robert S. Sanford. *Bureau of Mines, Report of Investigations* 4121, Nov. 1947, 14 pages.

Description of ore deposits and results of sampling and analysis. Results of flotation tests were unsatisfactory.

1c-4. Concentration of Carbonate and Oxide Manganese Ores From the Vicinity of Tracy, Central Calif. B. K. Shibler, W. W. Agey, and K. C. Vincent. *Bureau of Mines, Report of Investigations* 4137, Nov. 1947, 16 pages.

Brief separate reports on three widely differing ores. Five of the eight samples were amenable to the production of high-grade manganese concentrates by ore-dressing methods.

1c-5. Beneficiation of Oxide and Carbonate Manganese Ores From the Philipsburg District, Granite County, Mont. R. R. Wells, A. O. Ipsen, and K. C. Vincent. *Bureau of Mines, Report of Investigations* 4138, Nov. 1947, 14 pages.

All of the ores were amenable to the production of high-grade metallurgical manganese products marketable with small silica-plus-alumina penalties. Psilomelane and pyrolusite are the chief manganese minerals. The chief gangue mineral is silica, which occurs as quartz and quartzite. Zinc and silver are present in appreciable quantities, either chemically combined with the manganese oxides or finely disseminated throughout the ore.

1c-6. Concentration of Oxide Manganese Ores From the Vicinity of Long Valley, Coconino County, Ariz. C. H. Schack, H. G. Poole, and A. O. Ipsen. *Bureau of Mines, Report of Investigations* 4140, Nov. 1947, 13 pages.

Several types of ores, differing in grade and mineral associations, were studied. In all instances, the manganese minerals are psilomelane and pyrolusite, with minor amounts of other manganese oxides. The general possibilities of ore dressing in beneficiating the ores from this district, both from the individual operator's point of view, and for the district as a whole.

1c-7. Concentration of Manganese Ore From Southeastern Juab County, Utah. B. K. Shibler and R. Havens. *Bureau of Mines, Report of Investigations* 4141, Nov. 1947, 11 pages.

Results of ore-dressing tests on three samples from two properties. None of the samples were amenable to ore dressing for the production of high-grade manganese sinter.

1c-8. Concentration of Manganese Ores From Grand and Emery Counties, Utah. G. M. Potter, W. G. Sandell, B. K. Shibler, and H. D. Snedden. *Bureau of Mines, Report of Investigations* 4142, Dec. 1947, 40 pages.

Most of the ores were not amenable to the production of high-grade manganese conoentrates with high recoveries. Plus-48% manganese products were made with over 70% recoveries from only three of the 11 samples tested.

1c-9. Concentration of Oxide Manganese Ores From the Havasu Lake District, Calif. and Ariz. R. Havens, G. M. Potter, W. W. Agey, and R. R. Wells. *Bureau of Mines, Report of Investigations* 4147, Dec. 1947, 18 pages.

Work on five different ores, which varied widely in their constitution. Only one of the samples was amenable to concentration for production

(Turn to page 4)

The Shaping of Metals

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Progress in Hot Working, Cold Forming and Machining, Indicated by an Analysis of a Year's Technical Literature

By Francis W. Boulger

THIS ARTICLE attempts to trace recent progress in the fields of hot working, cold forming, and machining of metals by calling attention to pertinent articles in the technical literature; important and unusual developments are abstracted briefly. In addition to reporting work of a metallurgical nature, some attention is given to lubricants, new processes, and equipment because of their importance in affecting the success of metal-shaping operations.

Rolling and Forging

Interesting researches on rolling processes were described by several investigators. Ford (19-270, Sept. 1947)* carried out a number of experiments to determine the effects of variations in speed of cold rolling in the range from 8 to 250 ft. per min. He found that speed had no effect on the roll pressures, torque, and energy consumption for the first pass on annealed steel or copper. In very thin sheet or on previously cold worked stock, however, the roll pressure decreased appreciably with increasing speed. For example, a 30% reduction in gage on the fourth pass developed only two-thirds the roll pressure at 240 ft. per min. that it did at 8 ft. per min. Ford was unable to detect any particular amount of reduction, thickness of material, or ratio of roll diameter to sheet gage at which the speed effect became pronounced. The speed effect was apparent, however, on 0.017-in. thick steel sheet with 10-in. rolls.

This phenomenon explains why "off gage" is produced in continuous mills during periods of acceleration or deceleration. A mill will roll heavier sheet at low speeds if it is set to roll a certain gage at high speeds. After considering factors such as yield strength, roll flattening, and variations in friction and temperatures during rolling, Ford concluded that the explanation for the speed effect is unknown.

Grachev (19-294, Oct. 1947) conducted forging experiments to determine the relationship between temperature and amount of deformation necessary for the best final properties in hot worked steel. He proceeded on the belief that the best microstructure for medium-carbon forged or rolled steel is a mixture of fine-grained ferrite and imperfectly developed pearlite. The results of metallographic examination indicated that all deformation should be done at high temperatures to insure the desired (fine-grained) microstructures. The final grain size, however, seems less dependent on initial temperature if the deformation is heavy. Small forging reductions were considered detrimental even if followed by severe deformations at lower temperatures.

Grachev concluded that steels can be either strengthened or weakened by hot working. The proper forging and rolling practices should be used, especially on heavy sections, because it is difficult to correct properties of this grade by subsequent heat treatment.

The hot rolling of iron-carbon alloys containing more than 1.7% carbon is a subject that has attracted attention for years, but efforts to solve the problems involved have been limited and spasmodic because the possible applications seem scanty. Although gray and mixed structures do not respond satisfactorily, white irons can be given heavy reductions by hot rolling. Mechanical tests by Piwowarsky and Wittmoser (19-74, April 1947) showed that shear strength, tensile strength, and elongation are all substantially improved by hot working. As with steel, the finishing temperature has a strong influence on the properties of the wrought material. The narrow temperature range for plastic deformation imposes severe practical limitations.

Piwowarsky found that phosphorus below 0.1% gives the widest range in temperature for hot rolling, and the best mechanical properties. Even with this composition reheating between passes or at least before the final rolling reduction is necessary. These authors report, however, that rolling seems desirable for producing piston rings.

Cold Forming

Hibbard (3-326, Nov. 1947) studied two lots of 70-30 alpha brass which had received different amounts of cold work. Both sets of tubes exhibited well-developed preferred orientations on X-ray examination and resisted cracking by mercurous nitrate solutions. Based on these results, Hibbard presents the hypothesis that cracking in this test requires a localized area highly susceptible to corrosive attack, such as a grain boundary, and that the resultant notch raises the residual stress enough to cause cracking. If the adjacent grains are sufficiently similar, the susceptibility of boundaries to localized attack would be expected to be appreciably lower.

The theory of plastic straining has not advanced enough to be of much assistance in practical drawing problems. Considerable progress has been made by Baldwin and Howald (19-260, Sept. 1947), however, in relating tendencies for folding to more easily measured properties. They investigated folding or buckling which occurred in drawing different gages of steel and nonferrous blanks to cups in dies of various contours. Their data show good agreement between theory and experience, and it appears that tendencies for folding can be predicted from yield strengths if the drawing conditions are known.

Carapella and Shaw (19-123, June 1947) discovered that the limiting reduction for deep drawing of a 1.5% manganese magnesium alloy was raised from 25 to 40% by stepwise application of the load. The reduction possible at room temperature by intermittent application of the drawing force equaled the maximum at 450° F. by conventional methods. Magnesium and its alloys have comparatively few slip elements at room temperature because of their hexagonal crystal structure. Previous work by Barrett and Haller indicated that deformation in such materials at room temperature proceeds by twinning. Consequently the investigators postulate that retwinning occurred when the compressive load was released and applied in steps.

A high-speed press utilizing rotary rather than reciprocal motion to actuate the punch and die (20-492, Oct. 1947; 19-228, Aug. 1947) has seen considerable service in production. Two crankshafts rotating clockwise drive the upper head carrying the punch holder; another pair with a counterclockwise motion drives the lower head holding the die. Thus, the punch and die, having the same rotary motion as their crankshafts, operate on every cycle. Speeds up to 1800 strokes per min. are reported for a 10-ton model used for making nuts, washers, fasteners, and electrical parts.

Use of stampings in house furnishings is expanding even without the impetus expected eventually from prefabricated construction. One interesting new application is pressed metal pipe fittings (23-408, Nov. 1947) made from steel strip by blanking, forming, and copper brazing. They have satisfactory mechanical properties, and the manufacturers claim economic advantages from

* Literature references are cited by the corresponding item number in the *Review of Current Metal Literature* instead of repeating entire title, author, and source; this information can be obtained by referring to the *Metals Review* for the month indicated. All references are to the 1947 issues, except those otherwise designated.

of high-grade manganese products. A combined sand-tabling and slime-flotation treatment was used.

1c-10. Concentration of Oxide Manganese Ores From the Artillery Peak Deposit, Mohave County, Ariz. R. Havens, G. M. Potter, and S. J. Hussey. *Bureau of Mines, Report of Investigations* 4148, Nov. 1947, 16 pages

These ores present a difficult problem in concentration because they are low-grade and the association of manganese and gangue minerals is intimate and complex. The known size of this deposit has justified investigation of processes such as leaching for preliminary enrichment of the original feed. The ores from the Maggie Canyon area were amenable to concentration, and manganese recoveries of 73 to 78% were made in flotation concentrates that, when sintered, assayed over 35% Mn. However, the lower-grade Chapin Group ore was not amenable to beneficiation.

1c-11. Concentration of Oxide Manganese Ore From Sheep Mountain Property, Durkee District, Ore. R. R. Wells and W. W. Agey. *Bureau of Mines, Report of Investigations* 4149, Nov. 1947, 7 pages.

The ore contained a portion of the siliceous gangue so closely associated with the manganese minerals that concentrates low in silica were not produced by ore dressing methods. However, enough coarse, barren gangue was present to permit effective gravity treatment for the production of intermediate-grade concentrates.

1c-12. Boy Scout-Jones and Moss-Richardson Molybdenum Deposits, Halifax County, N. C. A. F. Robertson, F. K. McIntosh, and T. J. Ballard. *Bureau of Mines, Report of Investigations* 4156, Dec. 1947, 9 pages.

Geology of the deposits; a description of the ore, which is mainly molybdenite; and sampling results. Results of a few beneficiation tests, which were not too successful.

1c-13. Concentration of Gravity Tailings From the Grasselli Deposit, Park City, Utah. T. F. Mitchell, W. G. Sandell, G. M. Potter, B. K. Shibler, and J. V. Batty. *Bureau of Mines, Report of Investigations* 4159, Dec. 1947, 18 pages.

The low-grade Pb-Zn-Ag gravity tailings from the Grasselli deposit were effectively concentrated in the laboratory by combined sizing, gravity concentration, and flotation procedures. As a result of the data obtained, a mill with a capacity of 1500 tons per day has been built. The treatment includes screening, spiraling of the screen undersize and jigging of the oversize, classification and grinding of the jig and spiral concentrates, and separate flotation of the ground concentrates and spiral slime.

1c-14. Electrowinning of Manganese From Domestic Ores. J. H. Jacobs. *Bureau of Mines, Report of Investigations* 4163, Dec. 1947, 19 pages.

Ores from Metals Reserve stockpiles were processed in the Bureau of Mines pilot plant, Boulder City, Nev., to determine their suitability for the production of electrolytic manganese. Manganese was produced successfully from all of the ores. Procedures used, with variations for specific ores, included roasting, leaching, thickening, and removal of impurities by precipitation with H_2S.

1c-15. Electrowinning of Cobalt From Cobaltite Concentrates. F. K. Shelton, J. C. Stahl, and Ruth E. Churchward. *Bureau of Mines, Report of Investigations* 4172, Jan. 1948, 98 pages.

Results of laboratory and pilot-plant research work on the recovery of electrolytic cobalt metal. Data on various steps, a recommended process, and alternative flow sheets that may be preferable under certain conditions. Considerable electrolytic cobalt was recovered during the pilot-plant operation, and the authors believe that the process is ready for large-scale commercial production. An estimate of construction and operating costs is given for a plant having a capacity of 4000 lb. of metallic cobalt per day.

1c-16. Treatment of Auriferous Sulphide Ore From Near Tawonga, Victoria. *University of Melbourne, Ore-Dressing Investigation* No. 310, 10 pages.

Results of routine tests.

1c-17. Mufulira Copper Mines, Limited, Concentrator, Northern Rhodesia. Jack White and Ralph B. Adair. *Mining Technology,* v. 12, Jan. 1948, T.P. 2250, 9 pages.

Practices, including flow charts of ore-crushing and flotation operations.

1c-18. Description of Concentrating Operations, Roan Antelope Copper Mines, Limited, Northern Rhodesia. M. R. Goldick. *Mining Technology,* v. 12, Jan. 1948, T.P. 2251, 16 pages.

Equipment and practices.

1c-19. Mercury Industry in Italy. Edwin B. Eckel. *Mining Technology,* v. 12, Jan. 1948, T.P. 2292, 21 pages.

Based on brief field examination and on data supplied by operators, records condition of Italian mercury industry as of March 1945. Principal mines, mining and metallurgical methods, and manufacture of synthetic cinnabar.

1c-20. Gold Mining and Milling. Nathaniel Herz. *Mining and Metallurgy,* v. 29, Feb. 1948, p. 86-87.

1947 developments.

1c-21. Oscillating Burner Cuts Sintering Costs. *Compressed Air Magazine,* v. 53, Feb. 1948, p. 47.

Through installation of recently patented ignition device, Consolidated Mining & Smelting Co. of Canada, Ltd., is now sintering lead concentrates with a saving in fuel consumption of 40%.

1d—Light Metals

1d-1. Recovery of Alumina From Wyoming Anorthosite by the Lime-Soda Sinter Process. R. A. Brown, F. J. Cservenyak, R. G. Anderberg, H. J. Kandiner, and F. J. Frattali. *Bureau of Mines, Report of Investigations* 4132, Nov. 1947, 127 pages.

Small-scale tests supplemented by pilot-plant runs demonstrated that the alumina and soda occurring in the Wyoming anorthosite from the Laramie Range can be extracted and recovered satisfactorily by the lime-soda process. The sintered product from the rotary kiln can be dry-ground and extracted at temperatures up to 75° C. for periods up to 140 min. to effect recoveries of 80 and 77% of the Al_2O_3 and Na_2O, respectively.

1d-2. Elimination of Iron in Ammonium Sulphate Process for Production of Alumina From Clay. A. T. Sweet and G. Douglas Gardner. *Bureau of Mines, Report of Investigations* 4183, Jan. 1948, 13 pages.

The most satisfactory method of removing iron was the addition of calcined clay in the leaching step. This procedure involves no change in the regular leaching and crystallization flow sheet and causes most of the soluble iron to be precipitated, thereby preventing build-up of iron in the circulating liquors. The treatment has no appreciable effect on the extraction of alumina from the baked product, and little if any of the alumina in the calcined clay is extracted. 18 ref.

1d-3. Geochemistry of Beryllium. Michael Fleischer and E. N. Cameron. *Atomic Energy Commission,* MDDC 643, June 1946, 27 pages.

A review, with annotated bibliography, of the mode of occurrence of the element beryllium. Unpublished spectrographic studies of the Geological Survey on mill products are summarized. Data on domestic production and reserves and on foreign production. Suggestions for further investigations, particularly of methods of concentrating low-grade beryl ores, and of the occurrence of beryllium in American coals. 29 ref.

2 SMELTING, REDUCTION and REFINING

2a—General

2a-3. Alloys Made by Electric Ingot Process Have Improved Properties. H. R. Clauser. *Materials & Methods,* v. 27, Jan. 1948, p. 57-61.

How many of the defects common in steel produced by the usual means can be eliminated by a new process developed by M. W. Kellogg Co., which results in alloys free of segregation and having better properties.

2a-4. Metal Refining; Physical, Electrolytic and Chemical Methods. C. W. Dannatt. *Metal Industry,* v. 72, Jan. 2, 1948, p. 3-5; Jan. 9, 1948, p. 25-27.

Relationship between the various operations of ore treatment. Free-energy curves for various oxides for use in refining by preferential oxidation. (Presented before London Local Section of Institute of Metals).

2b—Ferrous

2b-13. The Revolution in Steel. Harry W. McQuaid. *Metal Progress,* v. 53, Jan. 1948, p. 75-78.

Trend to high production rates; the nonintegrated, semi-integrated and fully integrated steel plant; consumer-owned steel plants. Blast furnace economics; role of the converter; metallurgical oxygen; high tonnage electrics; billet-type ingots; thermo-chemistry of steelmaking; effect of aluminum in steel; hardenability specifications.

2b-14. Clean Steel From Electrics. S. W. Poole. *Metal Progress,* v. 53, Jan. 1948, p. 91-96.

Proceedings of 5th Electric Furnace Steel Conference of A.I.M.E., Pittsburgh, Dec. 1947, are reported.

2b-15. Method for Increasing Steel Ingot Yield. *Iron Age,* v. 161, Jan. 22, 1948, p. 55.

The process involves the procedure for making the ingot and isolating the segregate zone so that it can be cropped with a minimum loss of good steel. In making the ingot, standard killed-steel melting practice is followed, except that the

(Turn to page 6)

stamping techniques. The fittings are used in the same way as cast or malleable iron fittings and are work-hardened enough to permit use of wrenches in assembly.

Surface Treatments and Lubrication

The surface condition of sheets, tools, and dies is of considerable importance in the forming operations. The finish of the sheet affects the adhesion of the lubricant, and it is common practice to specify dull and matte finishes for sheets on severe applications. Chromium plating (12-59, May 1947) benefits dies and punches used in small arms manufacture, by resisting metal pickup, simplifying repair and salvage, and providing a more wear resistant surface. Hemingway (20-501, Oct. 1947), on the other hand, found that superfinishing was better than plating for piercing punches used for blanking holes deeper than their diameter.

Closely related to the subject of surface preparation of work and tools is the selection of the lubricant. Spring points out that the advantages possible with improved materials and drawing dies are limited to some extent by the lubricant employed (21-18, March 1947). Extreme pressure and polar lubricants are coming into wider use because lubrication depends on the maintenance of the thin film under the high unit pressures that exist during drawing.

The principal function of drawing compounds is to prevent welding between tiny areas of tool and workpiece (a process which culminates in pickup and scoring) and to reduce friction. The tendency for welding or seizure is reduced by mechanically separating the surfaces or by increasing their chemical dissimilarity. The latter mechanism is exemplified by the use of nonferrous coatings on steels in severe applications, such as wiredrawing, and use of drawing compounds which form salts by reaction with the metal. Sulphurized oils or lubricants containing chlorides and phosphorus are believed to function by the latter mechanism. Inorganic fillers, such as graphite or talc, prevent welding by mechanically separating the tool and work surfaces. Polar lubricants may reduce friction where other agents prevent welding. Spring classifies drawing compounds in 15 groups and mentions a number of testing methods that have been used with various degrees of success.

Cutting Tools

Most progress seems to come from small improvements and logical extensions of current practices so it is somewhat surprising to encounter a radical development in metal cutting. Russian engineers have been experimenting with a process, best described as electro-erosion, for cutting hard metals. A condensation of a report by Rekshinskaya (20-463, Sept. 1947) gives a fairly complete description of the method and the results obtained.

The equipment resembles a metal disk saw, the disk being connected to the negative terminal and the workpiece held in a vise connected

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to the positive pole of a direct current circuit. In the presence of an electrolyte, used like a cutting fluid, an electric discharge is produced when the disk contacts the workpiece under slight pressures. Water glass (1.33 Baumé) is recommended as the electrolyte and copper-plated mild steel for the disk. Results with wheel speeds of 1100 to 1550 ft. per min., 18 volts, 90 amp., and pressures of 30 psi. are reported.

Cutting speeds on unhardened toolsteel were comparable to those of conventional sawing rates. Small sections (0.9 × 0.5 in.) of hardened high speed steel and cemented carbide were cut in ¾ and 1¼ min., respectively. The investigator claims that the electro-erosion process is quicker than abrasive disks for cutting hard metals in sections smaller than 1.7 sq. in., and gives smooth surfaces with sharp, even edges.

After a lapse of some years, the relationship between the microstructure of high speed steel tools and their cutting performance is again receiving serious attention. Wooding (3-143, June 1947) examined the quenched and tempered microstructures of a large number of tools to determine the cause of tool life variations in dry cutting tests. Various lots of high speed steel subjected to the same heat treatment exhibited different speeds of carbide solution. Wooding concludes that the tool life in continuous roughing cuts is longest when the microstructure of the tool is predominantly acicular. This microstructure indicates large quantities of dissolved carbon and is associated with high hot hardness. The tools which were best for continuous cutting were very poor for interrupted cutting. The best tool life ratings in interrupted cutting were obtained on samples which contained less of the acicular constituent. These steels gave higher values in torsion impact tests than the tools preferred for continuous cutting.

Similar machining tests were apparently used by Baer and Nehrenberg (18-189, Oct. 1947) to evaluate bainitic hardened high speed steel tools. They found that primary bainite improved the tool life in continuous cutting but not in interrupted cutting. Under the latter test conditions, secondary bainite was advantageous. Mixed primary and secondary bainite structures were better than quenched and tempered microstructures. Although the heat treating schedule seems rather time-consuming, the authors present commercial machining data showing that longer service was obtained on bainitic tools than others given the usual heat treatment.

Klein and Rideout (20-657, Dec. 1947) describe an improved alumina abrasive grit produced by a new process. The alpha alumina abrasive contains less of the softer beta crystal modification and fewer microscopic cavities that the usual grit. In this process the purified, fused charge solidifies into individual alumina crystals which can be liberated from the matrix containing the impurities by leaching. Water is used in a continuous slaker to hydrolyze the sulphide matrix and wash away the sludge. The individual grains of alumina are subsequently cleaned magnetically and sized. Since each particle is a single crystal, the particles have flatter faces and sharper edges than those characteristic of the usual product produced by milling.

Anthony's report on commercial applications of the new abrasive (20-499, Jan. 1947) indicates that it cuts faster and cooler than the regular product and reduces costs by virtue of heavier cuts and less frequent redressing. During one year of field trials, the new abrasive was applied to automatic, centerless, and surface grinder work.

The discussion of crush dressing versus diamond dressing of abrasive wheels for thread grinding continues unabated. Flanders, in one of the first publications comparing the two dressing methods on similar jobs (20-76, March 1947) concludes that crush dressing is best suited when maximum stock removal efficiency is desired and on multiribbed work calling for Class III or less accurate threads. In his tests, a larger number of parts were produced per dressing on crush-dressed, vitrified wheels, but diamond-dressed, resin-bonded wheels could be operated satisfactorily at higher wheel and work speeds. Therefore, the choice of dressing method should be based on comparison of the number of pieces produced per hour and the product requirements. Wheels can be crush-formed to shape faster, but diamond-dressed wheels give better average accuracy and finish.

Cutting Fluids

To attain maximum efficiency in machining operations, cutting fluids should be selected as carefully as the materials and cutting tools. Flynn provides a useful guide for choosing cutting fluids for conventional operations on both ferrous and nonferrous metals (21-72, Sept. 1947). Service requirements for different operations, the types of compounds, and methods of handling and supplying them to the tool and workpiece are described clearly and completely.

The trends toward transparent or light-colored, odorless cutting oils and wider use of soluble oils and compounds in cutting operations are pointed out by Beard (21-19, March 1947). Machine tool builders are recognizing the advantages of sealing the lubrication systems so that sol-

steel is poured into a big-end-up mold of a taper two or three times that normally used on hot-top ingots. This is followed by press punching, upsetting, and forging. (Based on paper by G. A. Dornin, Jr., given at Electric Furnace Steel Conference, A.I.M.E.).

2b-16. Recent Advances in Steel Plant Furnace Operations. *Industrial Heating,* v. 15, Jan. 1948, p. 76, 78, 80, 82.

Reviews seven papers presented at special Panel on Coke Ovens, Blast Furnaces, and Steelmaking Furnaces, conducted by A.I.S.I. at its recent annual meeting in New York. Topics were: training of metallurgists; design for blast furnace hearths; blast furnace bell development; items of controllability in the openhearth combustion process; use of oxygen in openhearth practice for carbon reduction; mineralogy of openhearth slags.

2b-17. Oxygen in Steelmaking. William Mann. *Scientific American,* v. 178, Feb. 1948, p. 52-56.

Advantages and practical limitations.

2b-18. Eliminating Carbon With Oxygen. W. B. Arness. *Steel,* v. 122, Feb. 2, 1948, p. 120, 122, 125, 129-130, 133-134, 136, 138.

Summarizes results obtained at A. M. Byers Co. in eliminating carbon in about 1200 40-ton heats of commercial-quality electric furnace steel. Results were so satisfactory that oxygen is now largely used to supplant ore and other oxidizing materials.

2b-19. Influence of Carbon on the Equilibria Between Steel and Slag in the Acid Openhearth Furnace. P. Herasymenko. *Journal of the Iron and Steel Institute,* v. 157, Dec. 1947, p. 515-525.

Contrary to the previous conclusions, it is believed that equilibrium can easily be obtained for most of the slag-metal reactions taking place in acid openhearth heats. The reactions $Mn+FeO=MnO+Fe$, and $Si+2MnO=SiO_2+2Mn$; mechanism of the oxidation of carbon in the acid openhearth furnace. 11 ref.

2b-20. Electrolytic Manganese in Acid and Basic Electric Steel Foundry Practice and Basic Steel Ingot Production. F. Sillers, Jr., R. T. C. Rasmussen, and J. H. Jacobs. *Bureau of Mines, Report of Investigations* 4157, Dec. 1947, 24 pages.

Results of cooperative tests conducted in six commercial plants. They confirm the results of previous tests, namely, that electrolytic manganese is acceptable in place of regular grades of ferromanganese, except for price.

2b-21. Utilization of Oxygen in Smelting Low-Grade Ores. W. M. Pollitzer. *Steel,* v. 122, Feb. 16, 1948, p. 98, 101-102, 104. Based on Report PB-81385, Office of Technical Services, Department of Commerce, Washington.

Results of experiments with oxygen-enriched air in low-shaft German blast furnaces producing pig iron and ferrochrome. Use of oxygen in excess of 24 to 26% increases manganese in slag drastically. High temperature has little effect on furnace lining.

2b-22. Desulphurization of Iron at About 1100°. H. J. Tress *Chemistry & Industry,* Jan. 24, 1948, p. 57.

2b-23. Accelerating Carbon Elimination of the Openhearth Bath. J. N. Hornak. *Iron and Steel Engineer,* v. 25, Jan. 1948, p. 39-45.

Test work done at Carnegie-Illinois, Homestead, Pa., to determine the most economical concentration of oxygen for carbon reduction. (Presented at A.I.S.E. Annual Convention, Pittsburgh, Sept. 23, 1947.)

2b-24. Blast Furnaces Become Heat Economy Conscious. Owen R. Rice. *Blast Furnace and Steel Plant,* v. 36, Jan. 1948, p. 54-56.

Various changes being considered, including abandoning use of hearth-cooling staves; improvement in operation of hot-blast stoves; use of high pressure; and use of oxygen.

2b-25. Openhearth Developments for 1947. W. C. Kitto. *Blast Furnace and Steel Plant,* v. 36, Jan. 1948, p. 57-60.

A review.

2b-26. Developments in the Electric Furnace Industry During 1947. W. J. Reagan. *Blast Furnace and Steel Plant,* v. 36, Jan. 1948, p. 61-63.

A review. Refers only to the steel industry.

2b-27. Oxygen in the Steel Industry—Past, Present and Future. George V. Slottman. *Blast Furnace and Steel Plant,* v. 36, Jan. 1948, p. 64-69.

2b-28. Recent Problems and Developments in Steelmaking Controls. H. J. Forsyth. *Blast Furnace and Steel Plant,* v. 36, Jan. 1948, p. 70-75.

Desulphurization of iron; use of statistical methods in study of analysis fluctuation; progress in use of bath-temperature measurements; erosion of ladle nozzles and nozzle design; and ingot-mold studies.

2b-29. Oxygen Activities During 1947. J. H. Zimmerman. *Blast Furnace and Steel Plant,* v. 36, Jan. 1948, p. 83-85.

New developments in uses in steelmaking furnaces; powder scarfing; and powder cutting.

2b-30. An Evaluation of Steel Cleanliness. Philip Schane, Jr. *Blast Furnace and Steel Plant,* v. 36, Jan. 1948, p. 135.

The testing of steel for inclusions, requirements for various applications, causes of inclusions, and methods for their prevention or minimization. (Condensed from paper presented to 5th annual Conference on Electric-Furnace Steel, A.I.M.E., Pittsburgh, Dec. 4, 1947.)

2b-31. Ferrous Production Metallurgy. M. W. Lightner and Shadburn Marshall. *Mining and Metallurgy,* v. 29, Feb. 1948, p. 111-113.

1947 developments.

2b-32. High Pressure Operation; Full Scale Blast Furnace Trials. (Concluded) J. H. Slater. *Iron and Steel,* v. 21, Jan. 1948, p. 15-17.

Previously abstracted from *Blast Furnace and Steel Plant,* v. 35, Sept. 1947, p. 1083-1090; Oct. 1947, p. 1213-1218. See items 2-234 and 2-255, R.M.L., v. 4, 1947.

2b-33. A Quantitative Experimental Investigation of the Hydrogen and Nitrogen Contents of Steel During Commercial Melting. Clarence E. Sims, George A. Moore, and Donald W. Williams. *Metals Technology,* v. 15, Feb. 1948, T.P. 2347, 19 pages.

Results of an investigation sponsored by Steel Founders' Society of America at Battelle Memorial Institute. Hydrogen analyses of a precision considerably higher than any previously reported were made. Section 1 consists of a brief resumé of the literature. Section 2 describes the behavior of 20 commercial heats using the four usual methods, together with an analysis of the factors which affect the hydrogen content. It was found that sufficient hydrogen remains in test bars and castings to cause important reductions in ductility. Maintenance of a strong boil during steelmaking, and other precautions result in beneficial reduction of hydrogen especially in the acid arc furnace. 13 ref. (Complete experimental data are available on Recordak film upon request to Battelle Memorial Institute, Columbus, Ohio.)

2b-34. Mold-Weight/Ingot-Weight Ratio and Its Relation to Mold Consumption. N. H. Bacon. *Journal of the Iron and Steel Institute,* v. 158, Jan. 1948, p. 81-95.

Comprehensive data provided by three Ingot Molds Sub-Committee questionnaires (one prewar and two postwar) and B.I.O.S. Final Report No. 685, "German Ingot Molds for the Casting of Steel Ingots", have been evaluated. The importance of the mold-weight/ingot-weight ratio in its relation to mold consumption has been established. Attention is drawn to the very large variations in this ratio found within the United Kingdom and Germany and possible reasons for such variations are suggested. A graph is given showing the apparent optimum ratio for molds of capacities of more than 18 cwt.

2b-35. Ingot Surface Defects; Forma- of "Double Skin" or "Curtaining" on Top-Poured Mild Steel Ingots. P. Walker. *Journal of the Iron and Steel Institute,* v. 158, Jan. 1948, p. 96-98.

Work conducted to determine the cause of these defects. Results indicate that two factors are of significance: trapping of deoxidation slag near the ingot surface during solidification and splash moving forward from the mold wall and allowing liquid steel to flow behind it.

2b–36. Oxygen in Steelworks. *Metallurgia,* v. 37, Jan. 1948, p. 117-118.

Reviews recent progress.

2b-37. The Oxygen Blast—a New Step in Metallurgical Developments. (In Russian.) I. P. Bardin. *Izvestiya Akademii Nauk SSSR, Otdelnie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the U.S.S.R., Section of Technical Sciences), Oct. 1947, p. 1363-1368.

Present status of the above development in the U.S.S.R. and elsewhere. Improvements made possible and avenues for future research.

2c—Nonferrous

2c-7. Nonferrous Metallurgists Report New Processes. Carle R. Hayward. *Engineering and Mining Journal,* v. 149, Feb. 1948, p. 114-117.

1947 developments with mention of continuous casting of copper-base alloys.

2c-8. Production of Rare Earth and Thorium Compounds from Monazite. Part I. E. S. Pilkington and A. W. Wylie. *Journal of the Society of Chemical Industry,* v. 66, Nov. 1947, p. 387-393.

A process for separation of rare-earth elements in monazite into cerium-group hydroxides containing thorium hydroxide and crude thorium oxalate. Quantitative aspects of the various methods used to accomplish the separations. 22 ref.

2c-9. Pilot-Plant Distillation and Purification or Titanium Tetrachloride. C. Kerby Stoddard and Emil Pietz. *Bureau of Mines, Report of Investigations* 4153, Dec. 1947, 40 p.

The pilot-plant production of ductile titanium by the modified Kroll process requires large amounts of pure $TiCl_4$. The usual commercial product is not pure enough. Details of laboratory and pilot-plant work on development of suitable processes. Both distillation and chemical purification are required. The most satisfactory purifying reagent is copper powder. Includes information on recommended design of, and materials for, commercial equipment; heat-balance data; and method of analysis for $SiCl_4$. 22 ref.

2c-10. Metallurgy of Lead. R. D. Brad-

(Turn to page 8)

uble oils can be used in automatics and of maintaining cutting oils at uniform temperatures. The addition of certain nontoxic chlorinated compounds to cutting fluids is especially beneficial for machining aluminum and for operations on steel involving continuous heavy feeds such as drilling and parting.

As to the mechanism by which cutting fluids function, Shaw (21-73, Sept. 1947) marshals strong arguments to support the theory that many benefits of cutting fluids derive from a chemical-physical process. According to this theory, (which is now widely held) the fluid reacts chemically with the metal to form a low shear strength compound which physically prevents contact between chip and tool. The importance of the chemical action is supported by observations that certain fluids are effective in vapor form, certain additions which are chemically active are beneficial, and that the effectiveness of certain fluids depends on the metal being machined. Brewington, however, (21-30, April 1947) seems to attach more importance to the physical properties and effects of cutting fluids.

Effects of Machining

Studying the effects of machining and grinding on the properties of the workpiece, Glikman and Stepanov (4-126, Oct. 1947) found that phase changes occurred in the extreme surface layers of steels ground in the martensitic condition. Pearlitic structures gave no evidence of such changes, which would be expected to increase the residual tensile stresses at the surface of ground parts.

Boyer (20-461, Sept. 1947) studied the distortion resulting from dry grinding of rings having a ⅞-in. internal diameter and ⅛-in. square cross section. Rings of A 52100 steel were ground in different conditions of heat treatment, and then split to determine movement or distortion. With rings ground in the hardened condition the warping persisted after heating at 1300° F., whereas the distortion of those ground in the annealed state was eliminated by tempering at 500° F. Furthermore, samples oil quenched from 1800° F. warped less in the test than others quenched from 1550° F. and ground similarly. Boyer tentatively concludes that part of the residual tensile stresses are canceled by the larger volume change accompanying the austenite-martensite transformation in the samples retaining more austenite after quenching from 1800° F. The much smaller distortion of the annealed samples presumably results from less martensite formation during grinding (as indicated by the Russians referred to above). Boyer also presents endurance and notched-bar data indicating that grinding impairs properties even when no cracks are discovered.

The depth of workhardening of the surface of magnesium alloys and steel when milled was investigated by Zankl and coworkers (20-52, Feb. 1947). They found that the distortion of the grains in the surface layers was greater and extended to greater depths when negative-rake cutters were used than with positive-rake cutters. Their conclusions are based on X-ray diffraction patterns obtained from the surface of specimens milled under various conditions. Lack of resolution of the $K\alpha$ doublet was used as a semiquantitative measure of the crystal fragmentation or amount of cold work.

One set of experiments involved taking a cut 0.040 in. deep at 1180 ft. per min. with cutters having +30, 0, and −30° rake. The diffraction patterns indicated that the cold work of the surface increased with increasing negative rake. When 0.003 in. was removed from the surface of the magnesium-manganese alloy by etching, diffraction patterns indicated no cold work on the new surface of the sample milled with the positive-angle cutter. The specimens milled with 0° or −30° rake angles still showed evidence of grain distortion. After a layer 0.005 in. deep had been removed by etching, the sample prepared with the 0° rake-angle cutter exhibited little effect of cold work, but considerable distortion was still visible on the sample milled with the −30° rake-angle cutter. The speed of milling apparently affected the amount of workhardening, but this point was not explored.

The results obtained by Zankl seem reasonable, because it might be expected that the surface deformation increases with the force required in machining. Armitage and Schmidt (20-378, Oct. 1945) have previously shown that tool forces increase as the radial rake angle of milling cutters becomes more negative.

According to Schmidt (20-253, June, 1947), the surface finish produced on steel by face milling depends much more on cutting speeds and feeds than on tool rake angle. The higher the speed and the lighter the feed, the better the surface finish. The total benefits from these expedients are limited, however, because tool wear increases in the same direction. Schmidt's conclusions are founded on considerable data and seem logical, although they disagree with statements in a number of nontechnical articles.

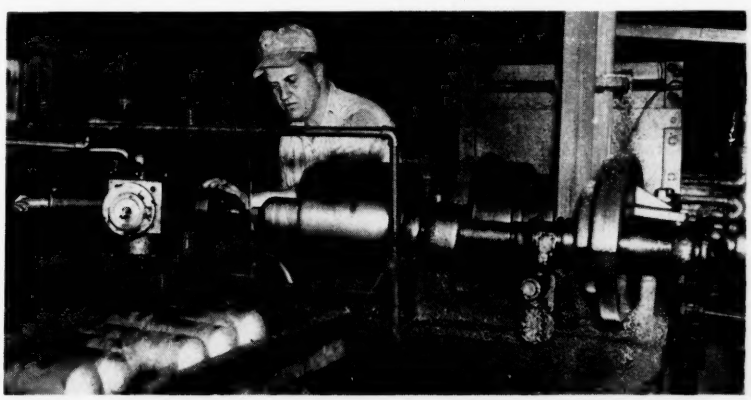
Machinability Testing

Wolfe (20-108, April 1947) conducted a number of machining tests on quenched and tempered steels and reports that a second tempering followed by oil quenching is beneficial. The tool temperatures and the heat in the chips were both lower for samples tested for machinability after a double tempering treatment. The second tempering was accompanied by slight softening and carbide coalescence, a probable decrease in residual stresses, and reduction in Meyer's coefficient of workhardening as measured by hardness tests.

Field and Stansbury (20-480, Sept. 1947), investigating the machinability of cast iron, showed that microstructure is of greater importance than composition or strength. Ferrite plus graphite structures received the best ratings; free carbide is detrimental and 5% of steadite is slightly harmful at high speeds but beneficial to tool life at low speeds. The power requirements were about the same for all pearlite and graphite structures tested, but tool life increased with increasing coarseness of the structure. Surface finish improved with increasing fineness of graphite distribution and cutting speeds. The publication contains enough micrographs to justify qualitative predictions of machinability by comparing them with microstructures of specific cast irons.

Zlatin and Merchant (20-259, July 1947) have correlated the hardness distribution in chips and machined surfaces with workhardening properties. Knoop hardnesses as high as 400 to 550 were found in workpiece and chip fragments, respectively, of low-carbon steel machined under various conditions. Chips were hardest on the surface next to the face of the tool because of the additional plastic deformation from sliding friction.

Schlesinger has attempted to simplify the problems of measuring machinability (20-30, Feb. 1947). He proposes rating machinability by measuring only the tangential (vertical) force component while machining with a 0.063-in. depth of cut and 0.016-in. feed (0.001 sq. in.) and eliminating other variables by standardization. The simplicity of the method is intriguing, but other investigators may not be easy to convince that all the necessary assumptions are justified. Furthermore, evidence indicates that results of cutting tests on lathes do not properly evaluate the performance of materials in other types of machining operations.



A Cylinder Boring Operation in a Large Metalworking Plant
Courtesy Penetone Co. *(see page 23)*

ford. *Mining and Metallurgy*, v. 29, Feb. 1948, p. 96-97.

1947 developments in production methods.

2c-11. Zinc Smelting. Francis P. Sinn. *Mining and Metallurgy*, v. 29, Feb. 1948, p. 97-98.

1947 developments.

2c-12. Silver; A Survey of Its Production, Properties and Engineering Uses. Part I—Extraction Methods. Part II—Refining and Fabrication. L. B. Hunt. *Metal Industry*, v. 72, Jan. 23, 1948, p. 63-66, Jan. 30, 1948, p. 83-87.

2c-13. Dezincing Lead Under Vacuum. *Compressed Air Magazine*, v. 53, Feb. 1948, p. 45.

Based on paper by W. T. Isabell, presented at March 1947 meeting of the A.I.M.E.

2c-14. The Control of Gas Content During the Melting of Phosphor Bronzes, Gun Metals and Leaded Bronzes. W. T. Pell-Walpole. *Metallurgia*, v. 37, Jan. 1948, p. 119-128.

Result of a detailed investigation on the effects of the CuO content of the flux and the amounts of gas and of phosphorus or zinc in the charge, on efficiency of degassing and on oxidation losses.

2c-15. Essais de Dégazage Sous Vide en Phase Solide des Métaux Autres que le fer Utilisés dans la Fabrication des Aciers Spéciaux, (Attempts to Degasify Solid Metals, Other Than Iron, Used in the Manufacture of Special Steels, by Evacuation.) J. Hochmann. *Revue de Métallurgie* v. 44, May-June 1947, p. 161-173.

Ni, Co, Al, FeSi, FeCr, FeMn, Fe_2N, Fe_4N, Mn_3N_2 and others were subjected to high temperatures under vacuum for degasification purposes. Results are tabulated.

2d—Light Metals

2d-2. Some Factors in the Reduction of the Iron Content of Magnesium-Base Alloys. II. Production-Scale Experiments. F. A. Fox, C. J. Bushrod, and S. E. Mayer, *Magnesium Review and Abstracts*, v. 7, Jan. 1947, p. 23-36.

Reprinted from *Journal of the Institute of Metals*, v. 73, no. 2, 1946.

2d-3. Degassing Aluminum Alloys; Experiments With Chlorine and Hexachlorethane. M. Grand. *Metal Industry*, v. 72, Jan. 9, 1948, p. 29-30.

Degassing agents, effect of degassing on alloy composition, and amount of porosity caused by gas. Light alloys are classified in order of affinity for gas. (Condensed from paper presented before 21st Congress of Association Technique de Fonderie, Paris.)

2d-4. Aluminum-Silicon Alloys by Electrothermal Reduction of Clay With Coke. *Metallurgia*, v. 37, Dec. 1947, p. 111-112.

Reviews recent papers.

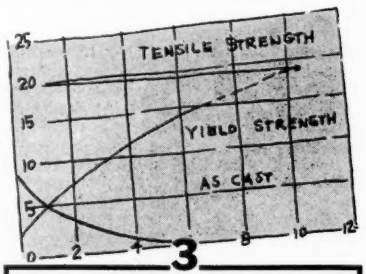
2d-5. Sur une Méthode d'Obtention des Métaux. (A Method for Obtaining Metals) Part II. Raymond Lautie and André Moutet. *Bulletin de la Société Chimique de France*, Sept.-Oct. 1947, p. 881-883.

Beryllium and magnesium minerals are reduced under vacuum by calcium carbide. These are then recovered by distillation in a very pure state in yields exceeding 80%.

2d-6. Conditions for Reduction of Silicon Dioxide in the Presence of Aluminum and Calcium Oxides. (In Russian.) Yu. K. Delimarskii and S. D. Shargorodskii. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 20, Aug. 1947, p. 781-793.

Experimental investigation designed to improve the process for recovery of alumina from clay and kaolin. The material contains several oxides, including SiO_2, Al_2O_3, Ca, Fe_2O_3, TiO_2, and others. Equilibrium was established at 1650° to 1700° C. in the slag-metal system investigated. At higher temperatures, the degree of silicon reduction increases, reaching 89% at 1750° C. 10% excess carbon is sufficient for maximum reduction. The optimum weight ratio of CaO to Al_2O_3 is 0.8 to 1.0. 25 ref.

For additional annotations indexed in other sections, see:
25b-29; 26b-4; 27b-14.



3 PROPERTIES

3a—General

3a-6. Impact Strength and Hardness of Aircraft Alloys Down to −423° F. M. G. Fontana and J. L. Zambrow. *Metal Progress*, v. 53, Jan. 1948, p. 97-100.

Data are presented from a study of Charpy keyhole-notch specimens and hardnesses of some Al and Mg alloys and steels used in aircraft construction, when cooled to temperatures close to absolute zero.

3a-7. Oiliness and Boundary Phase Friction. H. Umstätter. *Engineers' Digest* (American Edition) v. 4, Dec. 1947, p. 570-572. Translated and condensed from *Die Technik*, v. 2, April 1947, p. 171-176.

In order to develop a mathematical relationship between boundary phase friction and the various factors by which it is affected, a formula for viscosity, based on the damping theory of internal friction, is used. This formula includes the density and the molecular weight of the lubricant. A relationship between surface tension and thermal oscillation frequency is developed and used to calculate frequency values for over 100 different chemicals. The degree of mutual solubility of two materials improves as their thermal oscillating frequencies approach each other. This fact may be used to predict the performance of suggested bearing alloys and lubricants and to explain known facts.

3a-8. Temperature Vs. Permeability in Nickel-Iron Alloys. Laurence C. Hicks. *Steel Horizons*, v. 10, no. 1, 1948, p. 16-17.

Experimental data for four alloys known as Mumetal, 4750, Monomax, and Sinimax; compositions are given.

3a-9. The Importance of Ultimate Extension as an Engineering Property of Materials. A. Fisher. *Magnesium Review and Abstracts*, v. 7, Jan. 1947, p. 3-17.

June 1946, p. 200. See Item 3-132, R.M.L., v. 3, 1946.

3a-10. Dislocation Theory of the Fatigue of Metals. E. S. Machlin. *National Advisory Committee for Aeronautics, Technical Note* No. 1489, Jan. 1948, 33 pages.

Theory for annealed solid solutions and an equation giving dependence of number of cycles for failure on stress, temperature, material parameters, and frequency for uniformly stressed specimens. A quantitative correlation between fatigue and creep was verified. 26 ref.

3a-11. Fundamental Considerations Regarding Friction. A Mitinsky. *Metal Progress*, v. 53, Jan. 1948, p. 102.

Friction is defined as loss of energy due to permanent deformation and local rupture within the parts in contact.

3a-12. Flow, Fracture and Ductility of Metals. D. J. McAdam Jr., G. W. Geil, and Frances Jane Cromwell. *Metal Technology*, v. 15, Jan. 1948, T. P. 2296, 30 pages.

Results of an investigation of the flow of notched and unnotched specimens of oxygen-free copper, monel, and ingot iron between yield and fracture. A study has thus been made of the flow and fracture of metals as affected by the stress system, and of the ductility of metals as affected by the stress system throughout plastic deformation. 34 ref.

3a-13. Metallic Creep. A. H. Sully. *Research*, v. 1, Oct. 1947, p. 19-24.

The phenomenon, its measurement, physical significance, and metallurgical aspects; and the development of creep resistant alloys.

3a-14. A Comparison of the Brittle Transition Temperatures as Determined by the Charpy Impact and the M.I.T. Slow Bend Tests. C. W. MacGregor and N. Grossman. *Welding Journal*, v. 27, Jan. 1948, p. 16s-19s.

Results of slow bend and Charpy impact tests on three different steels. Results show that the slow bend tests predict transition temperatures which lie on the upper knee of the Charpy "S" curve shortly before the sudden drop-off in energy values.

3a-15. Thermal Expansion Properties of Iron-Cobalt Alloys. M. E. Fine and W. C. Ellis. *Metals Technology*, v. 15, Feb. 1948, T. P. 2320, 13 pages.

Properties for temperatures from 30 to 850° C., correlation with other physical properties, and an explanation for the interrelation. 17 ref.

3a-16. The Thermodynamics of Irreversible Processes. IV. The Theory of Elasticity and Anelasticity. Carl Eckart. *Physical Review*, v. 73, Feb. 15, 1948, p. 373-382.

The traditional theory of the solid state is said to rest on two false assumptions. One is the principle of a constant relaxed (or standard) state. The other is the principle of relaxability-in-the-large, first formulated mathematically by DeSaint-Venant. It is shown that a principle of relaxability-in-the-small is sufficient for the geometry of strain—which then becomes a 3-dimensional Riemannian geometry. The kinematics of strain is next developed without introducing the principle of a constant relaxed state. A classical theory of anelasticity is established on this basis. The results are used to derive the equations for the waves of distortion and dilation in an ideal isotropic anelastic medium.

3a-17. Statistical Theory of the Elementary Process of Plastic Deformation. W. James Lyons. *Physical Review*, v. 73, Feb. 15, 1948, p. 413-414.

3a-18. The Propagation of Shock Waves in Steel and Lead. D. C. Pack, W. M. Evans, and H. J. James. *Proceedings of the Physical Society*, v. 60, Jan. 1, 1948, p. 1-8.

An investigation was made of the stress system set up by an explosive detonating in contact with a metal

(Turn to page 10)

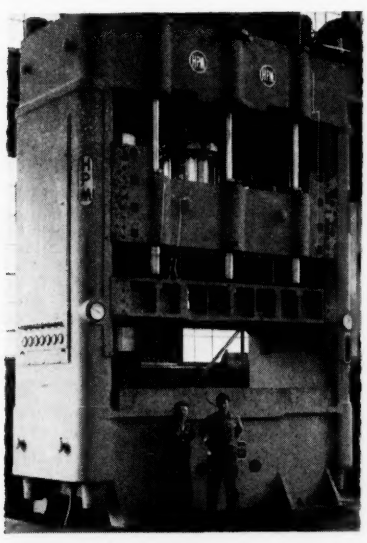
Presses and Tools

New Equipment for Shaping and Cutting of Metals, Introduced During the Past Year, as Described by the Manufacturers

SINCE MANY thousands of American firms are engaged in the business of manufacturing metalworking equipment, a never-ending procession of new machines, tools and accessories files across the industrial scene. To list and describe all of them in the small space at our disposal would be an impossible feat (the 35th annual review number of ***American Machinist*** used 167 pages to picture and describe 1500 products introduced during 1947), and the following brief notes and illustrations, therefore, include only a sampling of typical tools and machines—enough, it is hoped, to provide for the metallurgist a guide to the producing companies and to the trend of recent developments.

Much more complete and detailed information as well as descriptive literature is available from the manufacturers and can readily be secured by using the Reader Service Coupon on page 23 and ordering by number.

Metalworking presses and forming equipment were the subject of a special article in the November 1947 issue of *Metals Review,* and the presses listed below, therefore, comprise only the new equipment announced since that date. Metal cutting equipment was last covered in these pages a year ago, and new tools and machines since last March are listed below under appropriate headings.



1000-Ton Hydraulic Deep Drawing Press for Sheet Metal

Presses—Metal Forming

One of the largest presses in the industry for deep drawing of sheet metal has a bed size 144 x 84 in. It is a 1000-ton double-action hydraulic press, equipped with a 200-hp. electric motor to operate the radial-piston pump. Both blankholder and die cushion are hydraulically operated, pressure and speed independently adjustable. (Literature available.) **Hydraulic Press Mfg. Co. (203)**

Unique feature of a 200-ton hydraulic straightening press is that the pressure can be traversed not only along the bed but also at right angles to the bed; bed area is 120 x 38 in. **Hydraulic Press Mfg. Co. (204)**

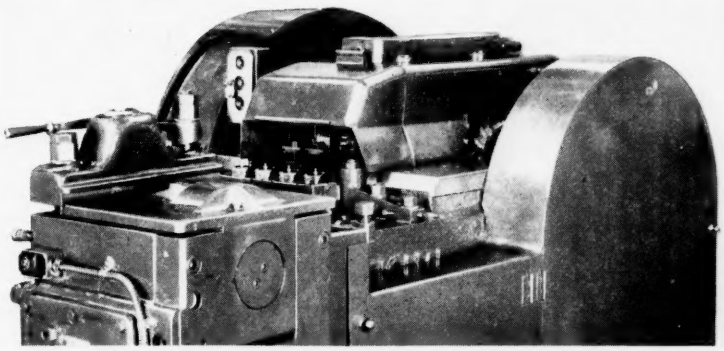
"Ten-Ton-Tony" is the name given to a midget hydraulic unit that can be used to operate arbor presses, hydraulic clamping vises, forming, straightening and bending devices. **Hydraulic Press Mfg. Co. (205)**

A hydraulic press brake for sheet metal and light plate forming handles material up to ¼ in. wide by 10 ft. long. Overall die surface length is 12 ft. and throat depth is 8 in. Automatic controls maintain the ram at level or any desired tilt position within 0.0025 in. **Pacific Industrial Mfg. Co. (206)**

Hydraulic bulldozers for bending and forming operations are compact, self-contained units that can be moved to new locations when necessary with a minimum of delay and expense. (Literature available.) **Lake Erie Engineering Corp. (207)**

"Practical Facts About Hydraulic Presses in Modern Industry" is an informative guide for the buyer and user of hydraulic presses. **Lake Erie Engineering Corp. (208)**

Standardization of hydraulic presses is brought to a high degree in a line of 75 presses in capacities ranging from 6 to 150 tons, available for prompt delivery with a wide choice of control equipment, accessories and fixtures. The three series—straightening, forcing and column-type presses—are suitable for a wide variety of operations. (Literature available.) **Hannifin Corp. (209)**



Automatic Cold Nut Former. National Machinery Co. (See page 11)

Applicable to many common press fit assembling operations, two new small-size air-operated arbor presses feature a push-button controlled electric valve that makes for faster operation than a manual valve. **Hannifin Corp. (210)**

Mechanical power presses for straightening, assembling, push broaching and cold riveting are operated by foot pedal. The operator can exert as much or as little power as is required by simply varying his pressure on the pedal. (Literature available.) **General Mfg. Co. (211)**

Adaptability to a wide variety of work, either heavy or light, is a valuable feature of Chicago steel press brakes. The patented non-deflecting bed insures equalized bending pressures and uniform cross section of bent form. (Literature available.) **Dreis & Krump Mfg. Co. (212)**

Induction hardening of the wearing edges of long press brake forming dies is a new idea that gives uniform hardness, faster and lower cost die production. (Literature available, in particular a catalog of forming press dies and their uses.) **Dreis & Krump Mfg. Co. (213)**

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surface. The time taken by the fastest pulse to penetrate various lengths of steel and of lead was measured experimentally. The results show that the plane elastic waves move more quickly for steel; while for lead the shock wave before damping has a velocity well in excess of that of the elastic waves.

3a-19. The Variation With Temperature of Metallic Reflectivity. Robert Weil. *Proceedings of the Physical Society*, v. 60, Jan. 1, 1948, p. 8-13.

Assuming free electrons alone to be responsible for the mechanism of metallic reflection, there is a wave length at which the temperature variation of reflectivity is zero. Since this wave length is directly proportional to the time of relaxation of the electrons, it must vary with the temperature. The effect of the bound electrons is also considered.

3a-20. Determination of Endurance Limit During Repeated Bending of Steel or Light Alloys on the Basis of Their Tensile Strength. (In Russian). S. L. Zhukov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 13, Oct. 1947, p. 1245-1252.

Possibility of correlation of endurance limits and tensile strengths. Investigation of a large amount of data from the literature resulted in development of correlation formulas. The formula for light alloys differs slightly from that for steels.

3b—Ferrous

3b-10. Magnetic Properties of Generator Rotors as Affected by Composition. G. S. Downing, W. E. Jones, and L. E. Osman. *Metal Progress*, v. 53, Jan. 1948, p. 87-90.

How routine data accumulated from a group of 89 large forgings over a period of time can be analyzed to point the way to an improved product. (To be continued.)

3b-11. Abrasion Resistance of Alloy White Cast Iron. Kenneth A. DeLonge. *American Society of Mechanical Engineers, Preprint*, 1947, 14 pages.

Improvement in the engineering properties and service performance of white cast iron when suitably alloyed to change the matrix structure from the usual pearlite to hard martensite. The resulting iron has a hardness range of 550 to 725 Brinell and 25 to 50% greater strength and toughness than the unalloyed material. The increase in its service life is usually in the order of two to three times. Specific applications and comparative performance data.

3b-12. Some Properties of Titanium Steels. L. Northcott and D. McLean. *Journal of the Iron and Steel Institute*, v. 157, Dec. 1947, p. 492-512.

The effects of up to 6% Ti on the structure and properties of plain carbon steel containing 0.1 to 1.0% C, and four low-alloy steels (Cr, Mo, Mn, Mo, Cr, Ni) were investigated. Vertical sections showing the constitution of the Fe-Ti-C system at constant Ti contents were prepared from the results of microexamination, hardness tests, and thermal analysis. Results of tensile tests at room and at elevated temperatures, in conjunction with hardness tests on quenched and tempered specimens are summarized. Results of other workers on the elimination of quench and strain-age hardening by Ti have been, to a great extent, confirmed. 14 ref.

3b-13. Note on the Temperature Variation of Young's Modulus of Various Steels. F. W. Jones and J. Nortcliffe. *Journal of the Iron and Steel Institute*, v. 157, Dec. 1947, p. 535-536.

There is a close similarity in the temperature variation of Young's modulus of different ferritic steels. Results for austenitic steels, however, do not show a correspondingly close similarity.

3b-14. Correspondence on the Paper —Abnormal Creep in Carbon Steels. *Journal of the Iron and Steel Institute*, v. 157, Dec. 1947, p. 579-586.

Correspondence of W. B. Brooks, W. E. Bardgett, and H. W. Kirkby, relative to paper by J. Glen (April 1947 issue). Bardgett's contribution consists of extensive experimental data on effect of treating with Si with no Al additions; effect of treating with Al with no Si additions; and effect of treating with Al in the presence of Si. Author's replies.

3b-15. The Dynamic Yield Strength of Steel at an Intermediate Rate of Loading. A. F. C. Brown and R. Edmonds. *Institution of Mechanical Engineers, Advance Copy*, 1947, 6 pages.

A comparison was made between dynamic and static tensile yield strengths of eight steels varying from mild steel to a heat treated low-alloy steel, by varying the rate of loading during an underwater explosion. Dynamic strength of steels with low static strength was 20 to 30% greater than their static yield strength but, for the stronger steels, the increase was less, being negligible for the heat treated low-alloy steel. This shows that any increase in strength under the dynamic loading considered is too small to be of importance in design.

3b-16. The Tensile Yield Strength of Certain Steels Under Suddenly Applied Loads. F. V. Warnock and J. B. Brennan. *Institution of Mechanical Engineers, Advance Copy*, 1947, 12 pages.

Dynamic tensile yield stresses were determined for eight steels, including one mild, two plain carbon, two C-Mn, one heat treated alloy, and two cast steels. The loads were applied by an impact machine of the falling-weight type. Electrical-resistance strain gages were used to record the loads. Comparison with static values reveals an increase in yield stress of 21 to 36% for the carbon steels under dynamic loading. The annealed cast steels behave in a similar manner but the heat treated alloy steel showed no appreciable increase with increase in rate of loading. A theory is developed to account for the variation in sensitivity of yield strength to load rate.

3b-17. Influence of Strain Aging on the Fracture Stress of Low-Carbon Steel. D. J. McAdam, Jr., G. W. Geil, D. H. Woodard, and W. D. Jenkins. *Metal Technology*, v. 15, Jan. 1948, T. P. 2318, 11 pages.

Specimens of annealed steels were plastically deformed various amounts at room temperature. Some of the specimens were cooled in liquid air and tested to fracture; others were aged before testing in liquid air and still others were aged, plastically deformed again, and finally tested to fracture in liquid air. With each metal, therefore, three curves were obtained. One represents the influence of plastic deformation alone, one the influence of plastic deformation plus strain aging, and the other represents the influence of plastic deformation of strain-aged metal. 20 ref.

3b-18. Heat Resistant Alloy Castings of the "HH" Type. E. F. Wilson. *Alloy Casting Bulletin*, Dec. 1947, p. 1-9.

The significance of certain specifications and test procedures, and available information on the properties of the "HH" type, which contains 25% Cr and 12% Ni.

3b-19. Properties and Weldability of Ni-Cr-Mo Special Steels. E. Henrion. *Engineers' Digest* (American Edition), v. 5, Jan. 1948, p. 41, 43. Translated and abstracted from *Revue de la Soudure*, v. 2, no. 2, 1946, p. 65-71.

3b-20. The Effect of Combined Stresses on the Transition Temperature for Brittle Fracture. C. W. MacGregor and N. Grossman. *Welding Journal*, v. 27, Jan. 1948, p. 7s-16s.

Bending tests on S.A.E. 1020, S.A.E. 1045 and S.A.E. 4140 steels at different temperatures and at various constant strain rates showed that a single type of notched bar has the same brittle transition temperature at the same effective strain rate as a circular disk freely supported and centrally loaded when constructed from the same material. Also, these tests indicate the feasibility of general correlation of properly notched bars and structures or machine parts for transition to brittle fracture. 10 ref.

3b-21. How to Develop Maximum Strength in Alloy Steel Bolts. G. Sachs. *Steel*, v. 122, Feb. 2, 1948, p. 104-106.

Previously abstracted from *Fasteners*, See item 3-414, R.M.L., v. 4, 1947.

3b-22. Abnormal Creep in Carbon Steel; Effect of Molybdenum. J. Glen. *Alloy Metals Review*, v. 5, Dec. 1947, p. 2-6.

Previously abstracted from *Journal of the Iron and Steel Institute*, April 1947. See item 3-145, R.M.L., v. 4, 1947.

3b-23. Corrosion Resistant Metals for Valves and Seats on Heavy-Duty Engines. A. T. Colwell. *SAE Quarterly Transactions*, v. 2, Jan. 1948, p. 94-103.

Previously abstracted from preprint. See item 3-218, R.M.L., v. 4, 1947. (Presented at S.A.E. Summer Meeting, French Lick, Ind., June 2, 1947.)

3b-24. Intermediate Alloy Steels at Elevated Temperatures. R. F. Miller. *Petroleum Engineer*, v. 19, Jan. 1948, p. 178, 180, 182, 184-186, 188-189.

Requirements for various applications, and data concerning the mechanical properties and elevated temperature corrosion resistance of ten steels most commonly used in the petroleum industry. 19 ref.

3b-25. Notch-Tensile Characteristic of a Partially Austempered, Low-Alloy Steel. G. Sachs, L. J. Ebert, and W. F. Brown. *Metals Technology*, v. 15, Feb. 1948, T. P. 2321, 12 pages.

Results on S.A.E. 5140 chromium steel indicate that the concentric and eccentric (static) notch-bar test may be used to evaluate brittleness occurring on partially austempering a low-alloy steel, while regular tensile testing is unsatisfactory for such specimens. Factors affecting notch properties of this steel, and effects of time of austempering on properties and structure. Additional tests indicate that very small quantities of intermediate products formed during conventional quenching may cause brittleness of any low-alloy steel in hard tempers.

3b-26. The Effect of Alloying Elements on the Hardness of Steel. L. F. Keeley. *Machinery Lloyd* (Overseas Edition), v. 20, Jan. 17, 1948, p. 68-72.

Effects of carbon; nickel; chromium; chromium plus nickel; molybdenum; manganese; tungsten; vanadium; cobalt; phosphorus; sulphur; lead; silicon; titanium and aluminum.

3b-27. Brittle Fracture in Mild-Steel Plates—II. *Engineering*, v. 165, Jan. 2,

(Turn to page 12)

A new edition of the Blue Book of Stamping Manufacturers lists members geographically and describes their facilities. **Pressed Metal Institute. (214)**

An automatic cold nut former will produce ⅜-in. nuts at the rate of 100 per min. Round stock is automatically fed into the machine from a coil, and a finished nut, ready for tapping, is produced on each stroke. **National Machinery Co. (215)**

Improved models of Pines automatic hydraulic tube and pipe bending machines are described in a new "Handbook of Tube Bending". **Pines Engineering Co., Inc. (216)**

Metal Cutting—The Machines

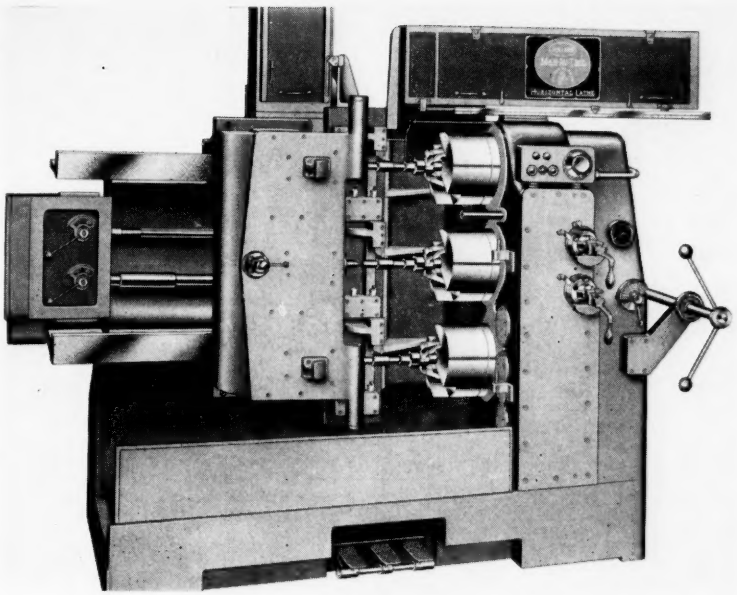
Turning and Boring

Model 30 Man-Au-Trol three-spindle horizontal lathe introduces a new principle in shaft turning. Tools are mounted in a vertical plane on a slide in back of the vertical plane in which the three spindles operate, permitting complete accessibility to the work. **Bullard Co. (217)**

The Type K Mult-Au-Matic is a high-speed development of the standard multiple-spindle machine tool. Models with six, eight, 12 or 16 spindles operate at speeds up to 900 r.p.m.; 41 speed changes and 82 rates of feed are available. **Bullard Co. (218)**

A 2½-in. single-spindle automatic turret machine has a Dialmatic electric tool feed drive which makes independent, infinitely variable forward and return tool feeds possible, without cam changes, for each of five tool positions in the turret head. **Cleveland Automatic Machine Co. (219)**

Electro-Cycle turret lathe for brass and other nonferrous materials has automatic drum control of the working sequence. It is mounted on the ram and mechanically actuated by either forward or backward indexing of the hexagon turret. **Warner & Swasey Co. (220)**



Three-Spindle Horizontal Lathe. Bullard Co.

A Magna-Matic lathe featuring electronically controlled feeds and automatic cycle is equipped with both front and rear carriage, each of which may be single or multiple tooled. **Monarch Machine Tool Co. (221)**

A 32-in. Model 150 engine lathe is used for hogging stock from large diameter work; it has seven speed ranges from 9 to 1200 r.p.m. **Monarch Machine Tool Co. (222)**

A quick-change box providing a large number of feeds and threads without change of gears is incorporated in two new heavy-duty lathes, one a 25-in. and the other a 16-in. model. **R. K. LeBlond Machine Tool Co. (223)**

A belt-driven 14-in. lathe is designed for general-purpose, light-duty work. It has a remote-controlled, belt-shifting arrangement. **Hendey Machine Co. (224)**

The Contourmatic is a standard engine lathe with a simplified hydraulic tracing attachment which synchronizes in-and-out movements of the cross slide with the longitudinal movement of the carriage. **Cincinnati Lathe & Tool Co. (225)**

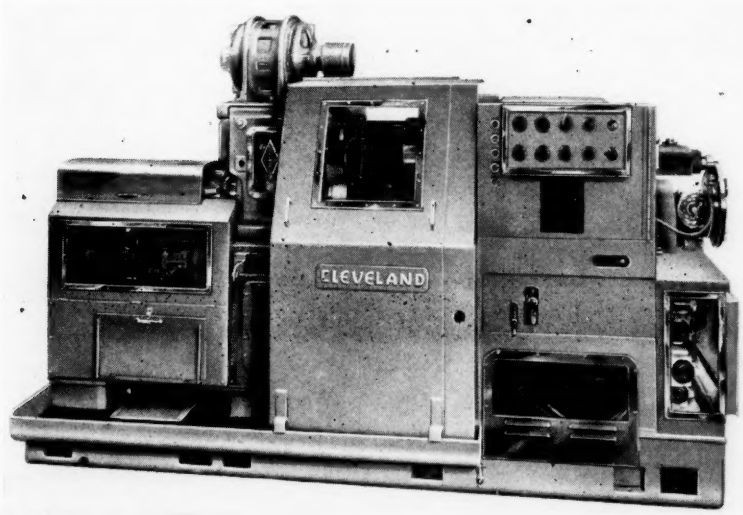
The Tracermatic uses a rotating master for producing ovals, squares, rectangles with rounded corners. The tracer not only controls cross and longitudinal movements of the tool, but regulates spindle speed as well. **Cincinnati Lathe & Tool Co. (226)**

Major improvements in quick setup and changeover, carbide tooling, interchangeability of tools and automaticity are incorporated in a new line of multiple-spindle automatic screw machines. Six independently cammed cross slides are radially arranged about the axis of the spindle carrier. **New Britain-Gridley Machine Division. (227)**

In addition to the regular jobs of straight boring and turning, facing and chamfering, a contour boring and turning machine can also produce lands, steps, recesses, flanges, counterbores and radii. The compound action obtained from contours on the two cams directs the single-point tool; it is fed free to the bottom of the bore and cuts on the drawback stroke. (Literature available.) **New Britain-Gridley Machine Division. (228)**

Several models of the Bore-Matic (both single-end and double-end) can be arranged with single or multiple spindles, and can do rough and finish boring, turning, facing, chamfering, grooving or fly-cutting. **Heald Machine Co. (229)**

Turret Lathe With Dialmatic Drive. Cleveland Automatic Machine Co.



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1948, p. 16-18; Jan. 16, 1948, p. 53; Jan. 23, 1948, p. 77-78.

First installment of Part II of the report on the proceedings of the conference held in Cambridge, England, in Oct. 1945, consists of "Fracture of Metals: Some Theoretical Considerations", by N. F. Mott. The present state of the theory for brittle substances is outlined and its application to ductile materials, especially metals, is discussed. Second installment consists of "Fundamental Physical and Metallurgical Aspects of Brittle Steel", by D. E. J. Offord. Some results obtained in the proof-testing of alloy steel armor plate are illustrated and discussed. Third installment consists of "An American Point of View", by E. M. MacCutcheon, who describes some of the experiences of the U. S. Coast Guard and of American shipbuilders. (To be continued.)

3b-28. The Creep Properties of Molybdenum, Chromium-Molybdenum and and Molybdenum-Vanadium Steels. J. Glen. *Journal of the Iron and Steel Institute,* v. 158, Jan. 1948, p. 37-80.

Variables to be considered in the study of creep; importance of controlling, and where possible, of isolating these variables. Limitations of short-time tests, particularly when estimating the creep characteristics of a new type of steel. Creep tests at different temperatures and stresses were conducted on 0.5% Mo; on 0.8% Cr, 0.5% Mo; and on 0.5% Mo, 0.25% V steels, and the effect of C, Si, Mn, and Al were determined. Effects of various heat treatments were also determined. Rupture tests of up to 58,000 hr. duration were conducted and the mode of failure is discussed. By an extensive series of long-time creep tests, the stress temperature relationships for 0.1% and 0.2% deformation in 100,000 hr. are estimated for the Mo-V steel and suitable short-time tests for checking the quality of such steels are discussed. Results show that the latter steel in normalized and tempered condition has creep and rupture properties much superior to those of the Mo and Cr-Mo steels. 20 ref.

3b-29. La Fatigue des Métaux. (Fatigue of Metals). M. Ros. *Revue de Métallurgie,* v. 44, May-June 1947, p. 125-143.

Nature, mechanism, and causes of fatigue failure, based on an experimental investigation of mild steel specimens.

3b-30. Investigation of the Relaxation Process in Tempered Steel by Use of a Ring-Shaped Test Specimen. (In Russian). D. M. Nakhimov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 13, Oct. 1947, p. 1222-1227.

In the method described, a wedge is used to expand a split ring. Results indicate that the relaxation process is of much higher intensity in steels of low structural stability.

3c—Nonferrous

3c-4. Contact Potentials Between Different Liquid Metals. (In Russian.) S. Karpachev and M. Smirnov. *Zhurnal Fizicheskoi Xhimii* (Journal of Physical Chemistry), v. 21, Oct. 1947, p. 1205-1212.

Contact potentials for molten Pb-Sn, Th-Pb, and Th-Sn were determined. Results are charted, tabulated, and discussed from the theoretical point of view. 11 ref.

3c-5. The Thermo-Electric Properties and Electrical Conductivity of Bismuth-Selenium Alloys. B. D. Cullity. *Metals Technology,* v. 15, Jan. 1948; T.P. 2313, 8 pages.

Results of an investigation made in an attempt to find a suitable material for use in thermo-electric generators. Effects of a number of addition agents. The binary alloy containing 37% Se was the only one found suitable. It had an efficiency of about 6%, when tested against a Zn-Sb alloy containing addition agents. Use of small amounts of Te improved the properties of the 37% alloys.

3c-6. The Absorption of Na^{24} Gamma-Radiation in Lead, Copper, and Aluminum. David E. Alburger. *Physical Review,* v. 73, Feb. 15, 1948, p. 344-346. Experimental results.

3d—Light Metals

3d-5. Development of Cast Aluminum Alloys for Elevated-Temperature Service. Webster Hodge, L. W. Eastwood, C. H. Lorig, and H. C. Cross. *National Advisory Committee for Aeronautics, Technical Note* No. 1444, Jan. 1948, 32 pages.

Effects of heat treatment and exposure to elevated temperatures on the tensile properties of various alloys subsequently cooled to room temperature; effects of various alloy additions on the room and elevated-temperature properties of 6% Mg aluminum alloys; and improvement in high-temperature creep properties.

3d-6. Effect of Various Stress Histories on the Flow and Fracture Characteristics of the Aluminum Alloy 24 S-T. J. J. Lynch, E. J. Ripling, and G. Sachs. *Metals Technology,* v. 15, Jan. 1948, T. P. 2307. 24 pages.

The effects of straining (at room temperature) by various methods on flow and fracture determined by tension tests. 12 ref.

3d-7. Zicral—A New High-Tensile Light Alloy. P. Vachet. *Engineers' Digest* (American Edition), v. 5, Jan. 1948, p. 31-35. Translated and condensed from *Revue de l'Aluminium,* v. 24, June 1947, p. 189-198; July-Aug. 1947, p. 225-233.

Development of above aluminum alloy, its corrosion resistance, protection by plating and anodizing, influence of purity and of chromium content, structure and metallography, heat treatment, working, mechanical and physical properties, and joining. Previously abstracted from original paper. See item 3-306, R.M.L., v. 4, 1947.

3d-8. Low-Cycle Fatigue of the Aluminum Alloy 24 S-T in Direct Stress. S. I. Liu, J. J. Lynch, E. J. Ripling, and G. Sachs. *Metals Technology,* v. 15, Feb. 1948, T. P. 2338, 22 pages.

Most investigations on fatigue are concerned entirely with large numbers of cycles. However, changes occurring after a small number of repeated loadings have attracted little attention. This paper deals with effects of strains of equal magnitude but different signs. The metal was first pre-strained in static tension by a certain amount then subjected to compression to yield the same amount of strain after unloading. This cycle was repeated up to a maximum of seven times. After various cycles, stress-strain curves in tension were determined, up to fracturing.

For additional annotations indexed in other sections, see:

4c-6; 5b-6; 9b-7; 14d-13; 18b-10; 22b-56; 23c-18.

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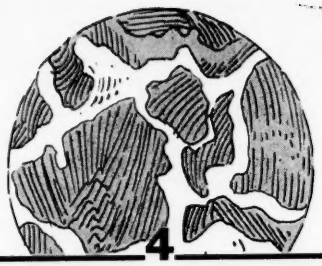


4 CONSTITUTION and STRUCTURE

4a—General

4a-4. On the Deformation of Metals and Alloys. J. Ternisien. *Engineers' Digest* (American Edition) v. 4, Dec. 1947, p. 584-586. Translated and condensed from *La Metallurgie,* v. 79, April 1947, p. 7-10.

Structural changes taking place during deformation and their determination by X-ray and metallographic methods. The former are superior and the problem of interpretation of Debye-Scherer diagrams is sufficiently well understood to warrant application to industrial control.

4a-5. Solubility of Iron in Liquid Magnesium. David W. Mitchell. *Metals Technology,* v. 15, Jan. 1948, T. P. 2309, 9 pages.

Solubility is small but appreciable. The iron liquidus in the temperature interval investigated is in excellent agreement with published data on the Mg-Fe system. A eutectic structure which has not appeared in the literature and which occurs only under certain conditions of cooling was observed. 11 ref.

4a-6. Diffusion, Mobility and Their Interrelation Through Free Energy in Binary Metallic Systems. L. S. Darken. *Metals Technology,* v. 15, Jan. 1948, T. P. 2311, 11 pages.

Recent experimental evidence given by Smigelskas and Kirkendall (October issue) indicates that diffusivity of the components of metallic systems proceeds at different rates for each component, which theory differs from previous concepts. Equations are developed for calculating individual diffusivities and for the overall diffusivity of binary alloys. These equations were checked against experimental data and found to be in satisfactory agreement. 14 ref.

4a-7. X-Ray Diffraction Rings From Deformed Solid Metal and Metal Powders. W. A. Wood and W. A. Rachinger. *Nature,* v. 161, Jan. 17, 1948, p. 93-94.

Changes in structure of metals as a result of plastic deformation are often studied by X-ray diffraction, using filings, it being assumed that the same difference exists between the annealed and the plastically deformed state in the powder as in the bulk form. This assumption was examined experimentally for iron, and it was found that the diffraction rings from the filings were considerably broader in all cases than from the bulk specimens. A theoretical explanation is presented.

4a-8. On the Structure of Grain Boundaries in Metals. T'ing-Sui Ke. *Physical Review,* v. 73, Feb. 1, 1948, p. 267-268.

Results of a study of activation energy associated with viscous slip along grain boundaries in alpha brass, alpha iron, and aluminum. Values for energies associated with

(Turn to page 14)

New Britain-Gridley Contour Boring and Turning Machine

Drilling and Tapping

The 20-in. swing Sibley is recommended as an all-purpose, high-speed drilling and tapping machine. A 2-hp. motor furnishes ample power to drill 1½ in. in mild steel. Accuracy and speed are obtained in a new drive mechanism with a double ball bearing spindle assembly. (Literature available.) **Sibley Machine & Foundry Corp. (230)**

The Buhrmatic is a fully automatic double-end machine for production drilling of crossed holes. It is hopper fed and ejects the work automatically. The machine drills, reams, countersinks and checks at desired angles by indexing the collets in an indexing turret, providing eight work stations. **Buhr Machine Tool Co. (231)**

A portable horizontal drilling and tapping machine is so constructed that the spindle can be placed in virtually any position. Four variables are provided, namely, power elevation of headstock on column, column and sub-base power traverse on the runway, tilting of the headstock 45° above and below the horizontal, and rotation of the column 360° on its sub-base. (Literature available.) **Kaukauna Machine Corp. (232)**

The No. 20 Man-Au-Trol locator is a compact 7-ton machine tool that precisely and automatically locates work in relation to a rigid, horizontal spindle for drilling, boring, reaming, tapping and allied operations. Twenty automatic stops each for longitudinal motion and vertical motion give a maximum potential of 400 positions. **Bullard Co. (233)**

A double-end drilling and centering machine provides both power feed and power clamping. It has individual motor drive to each head. **Sundstrand Machine Tool Co. (234)**

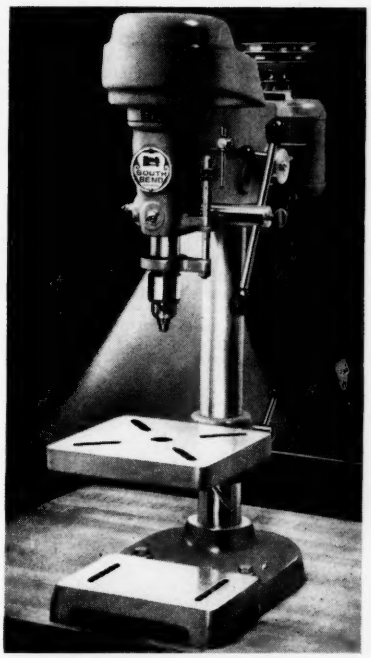
Radial drills with 13 to 19-in. columns include a tool ejector among several new features. To reduce setup time, clamping of the head and column are interlocked with engaging of the feed mechanism. **Fosdick Machine Tool Co. (235)**

A 14-in. precision drill press is available in both bench and floor models. Features are a quick-acting belt tension release lever that simplifies speed changes, a built-in light for proper illumination on work area, and a free-floating spindle design. **South Bend Lathe Works (236)**

A hydraulic power feed for sliding-head drill presses is simple in design yet can be operated automatically, semi-automatically or manually. **Canedy-Otto Mfg. Co. (237)**

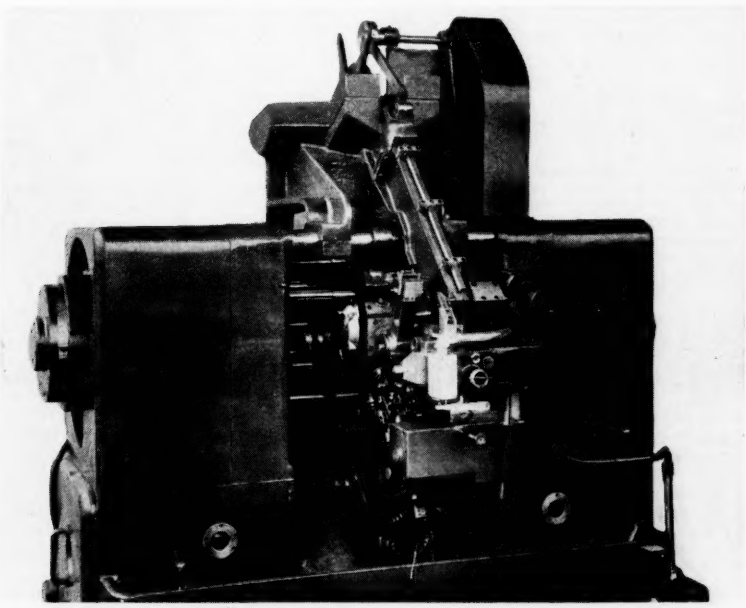
A special processing machine for drilling, reaming and counterboring automobile engine connecting rods and caps produces over 240 assemblies per hr. with a single operator. It has five stations controlled by buttons. **Sommer and Adams Co. (238)**

Drilling 80 holes at one pass, a special setup on a hydraulic drilling machine automatically handles four gas oven burners at one time to complete one burner every 30 sec. This typifies the adaptability of the Zagar gearless multiple-spindle drillhead, which will accommodate any practicable number of drills, in any pattern, on centers as close as twice the diameter of the drills. (Literature available.) **Zagar Tool, Inc. (239)**



South Bend Drill Press

Buhrmatic Double-End Drill



A continuous-flow Hi-Boy lubricating pump is one of the important features of a new series of Procunier universal tapping machines. Lubricant is supplied to the tap while it is backing out as well as during the tapping operation. (Literature available.) **Procunier Safety Chuck Co. (240)**

Model E leadscrew tapping machine permits use of multiple heads for tapping groups of holes, even of different pitch, with each stroke of the spindle. **Cleveland Tapping Machine Co. (241)**

A bench tapper has selective full automatic cycle or hand operation with safety clutch, which reduces tap breakage to a minimum. Change gears make all threads possible in tap diameters from No. 4 to 5/16 in. in cast iron or ¼ in. in steel. (Literature available.) **Buhr Machine Tool Co. (242)**

Milling and Broaching

Cincinnati's new milling machine No. 2 ML is 1000 lb. lighter than the previous model and driven by a 3-hp. instead of 5-hp. motor. It is available in both plain and universal styles with 16 spindle speeds from 25 to

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grain-boundary slip were close to diffusion values. If this is a general phenomenon, it indicates that grain-boundaries slip involves the same mechanism as diffusion and that it is creep on a microscopic scale.

4a-9. The Metallography of Electrodeposited Surfaces. (Continued.) **The Physics of Grinding and Polishing. Part I. The Influence of Machining Stresses on a Metal.** A. T. Steer. *Electroplating,* v. 1, Jan. 1948, p. 91-102.

Fundamentals of metal-crystal structure as a preliminary to a consideration of the case of the effect of applied stresses (machining or otherwise) on a single metal crystal and the effect of such stresses on the massive metal.

4a-10. Absolute Reaction Rate Theory for Diffusion in Metals. J. C. Fisher, J. H. Hollomon, and D. Turnbull. *Metals Technology,* v. 15, Feb. 1948, T. P. 2344, 10 pages.

Birchenall and Mehl have analyzed the problem on the basis of an assumption that the net flux of diffusing material is proportional to a thermodynamic activity gradient. Eyring and coworkers have formulated the problem using the chemical rate theory. The authors have attempted to rationalize the inconsistencies between the two analyses and to analyze diffusion in substitutional alloys on the basis of the concepts of chemical rate theory. It is shown that the interstitial diffusion co-efficient of Birchenall and Mehl can be derived from the theory of absolute reaction rates. For diffusion of carbon in austenite, agreement between theory and experiment is good. Expressions for diffusion co-efficient were derived for both direct interchange and lattice-vacancy mechanisms in 2-component substitutional alloys. Experimental diffusion of zinc in brass supports the theory. 18 ref.

4a-11. Plastic Deformation and the Size of the Lattice Unit Cell. (In Russian.) B. M. Rovinskii and T. V. Tagunova. *Zhurnal Teknicheskoi Fiziki* (Journal of Technical Physics), v. 17, Oct. 1947, p. 1137-1142.

Results of experimental investigation of various metal and alloy powders annealed at different temperatures indicate that the size of the unit cell does not change as a result of plastic deformation. Therefore, phase transformations are not related to nonelastic changes in the size of cell nuclei. However, connection with preceding lattice distortion is believed possible. 12 ref.

4b—Ferrous

4b-5. Spheroidization of Molybdenum Steel in High Temperature Service. R. F. Miller, E. V. Golaszewski, and G. V. Smith. *Metal Progress,* v. 53, Jan. 1948, p. 83-86.

Spheroidization, but not graphitization, was observed during exposure at 1000 to 1300° F. over periods up to 5000 hr. for normalized specimens of 0.14% C, 0.53% Mo steel of fine-grain deoxidation practice.

4b-6. The Effect of Hydrogen on the Ingot Structure of Killed Steels. *Industrial Heating,* v. 15, Jan. 1948, p. 84.

Summarizes paper by B. R. Queneau, presented at recent Seminar on Ingot Structure of the A.I.M.E., Chicago. Results of experimental work in which an ingot of S.A.E. 4140 steel was treated with hydrogen by means of a lance. The ingot was rolled and the microstructure was compared with other ingots from the same heat.

4b-7. Essai de Détermination de la Dimension Moyenne des Particules de Cementite Contenues dans les Divers Constituants d'un Acier Ordinair. (Attempt to Determine the Average Dimensions of Cementite Particle Contained in Various Constituents of Ordinary Steel). Pierre Borbaud. *Comptes Rendus* (France), v. 225, Nov. 10, 1947, p. 875-876.

X-ray diffusion was used to examine electropolished samples. In photometric determination of the pearlite and sorbite it was found that microparticles of cementite were also present.

4b-8. Graphitization and Failure of Steel in Service. *Welding Journal,* v. 27, Jan. 1948, p. 29s. Reprinted from *Tempil Topics,* Dec. 15, 1947.

Methods for prevention under high-pressure and high-temperature conditions.

4c—Nonferrous

4c-4. Sur l'Activité Chimique de l'Hydrogene Désorbé par le Palladium et ses Alliages. (The Chemical Activity of Hydrogen Adsorbed by Palladium and Its Alloys.) Jacques Bénard and Philippe Albert. *Bulletin de la Société Chimique de France,* Sept.-Oct. 1947, p. 904-909.

Polished pure palladium and palladium-gold foils were used. Some ionic hydrogen dissolved in the metal, some atomic hydrogen was adsorbed on the surface, and both atomic and molecular hydrogen were released. 12 ref.

4c-5. A Thermal Investigation of the Ternary System Mg-Na-Pb. Part II. The Compound MgNaPb and Several Cross Sections. George Calingaert, Hymin Shapiro and Ivar T. Krohn. *Journal of the American Chemical Society,* v. 70, Jan. 1948, p. 270-277.

Approximately 120 individual alloy compositions within the above system Mg-Na-Pb were investigated by thermal analysis. The system was shown to be complex. A second compound, MgNaPb, was discovered, but unlike the first compound, $Mg_2Na_2Pb_3$ (which is of the open maximum type), it is of the peritectic type. Several important cross sections of the system were partly elucidated. Thirty alloys were photographed, including the compound MgNaPb.

4c-6. The Constitution and Properties of Copper-Rich Copper-Chromium and Copper-Nickel-Chromium Alloys. Walter R. Hibbard, Jr., Fred D. Rosi, Howard T. Clark, Jr., and Robert I. O'Herron. *Metals Technology,* v. 15, Feb. 1948, T. P. 2317, 12 pages.

The binary CuCr alloys which were solution treated and aged or solution treated, cold rolled and aged had approximately the same or greater hardness values than the ternary Cu-Ni-Cr alloys. Similarly the addition of Cr to Cu had a greater effect in raising the softening temperature than the addition of Cr to Cu-Ni alloys containing 10, 20, or 30% Ni.

4c-7. Grain Growth in 70-30 Brass. Paul A. Beck, John Towers, and William D. Manly. *Metals Technology,* v. 15, Feb. 1948, T. P. 2326, 7 pages.

Shows that isothermal grain growth in 70-30 brass, as in pure aluminum, can be described by an empirical formula. The heat of activation associated with the growth was found to be 61,800 cal. per g. atom. 10 ref.

4c-8. The Nature of Strain Markings in Alpha Brass. J. E. Burke and C. S. Barrett. *Metals Technology,* v. 15, Feb. 1948, T. P. 2327, 12 pages.

Fine lines which appear on polishing and etching deformed specimens of alpha brass and other alloys were investigated by means of metallographic and X-ray studies. No evidence for twinning was found and it was concluded that strain markings are traces of slip bands which can be etched because of distortion in the region of the latter. 17 ref.

4c-9. The Copper-Rich Corner of the Copper-Aluminum-Silicon Diagram. Franklin H. Wilson. *Metals Technology,* v. 15, Feb. 1948, T. P. 2329, 12 pages.

Results, of sufficient precision to serve as a guide for the control of the manufacture of alloys in the region covered, are presented in a series of both isothermal and vertical sections of the diagram. The most conspicuous feature is the existence of the kappa phase of the Cu-Si system at as high as 8.5% Al.

4c-10. Activity Coefficients in Alpha Brass from Statistical Thermodynamics. Lester Guttman. *Metals Technology,* v. 15, Feb. 1948, T. P. 2330, 5 pages.

The free-energy formulas derived by Takegi on the basis of quasi-chemical theory are extended to give expressions for activity coefficients of the components of disordered binary solid solutions. The results may be applied with fair accuracy to the system α-CuZn. The degree of short-range order and approximate temperature of disappearance of long-range order are computed for the α-phase.

4c-11. Unpredicted Cross-Slip in Single Crystals of Alpha Brass. Robert Maddin, C. H. Mathewson, and W. R. Hibbard. *Metals Technology,* v. 15, Feb. 1948, T. P. 2331, 14 pages.

Part of an extensive investigation on the development and characteristics of glide ellipses in single, crystalline, alpha-brass rods. Especially concerned with observation of cross-slip in crystals oriented wholly within the range of slip on a single system according to the generalizations first presented by Taylor and Elam in 1923. The mechanism of plastic slip in the above material. 20 ref.

4c-12. Wire Textures of Copper and Its Binary Alpha Solid Solution Alloys With Aluminum, Nickel and Zinc. Walter R. Hibbard. *Metals Technology,* v. 15, Feb. 1948, T. P. 2334, 10 pages.

Theories of deformation textures are discussed with particular reference to the direction of flow and the presence of slip systems suitably oriented for stability and producing the necessary changes in shape required by the deformation mechanism. Effects of additions of different percentages of Al, Ni, and Zn on the above textures, 35 ref.

4c-13. Deformation Lines in Cold Rolled Copper and Its Binary Alpha Solid Solution Alloys With Aluminum, Nickel and Zinc. W. R. Hibbard, Harold Margolin, and H. P. Moore, *Metals Technology,* v. 15, Feb. 1948, T. P. 2336, 10 pages.

Lines were developed at lower percentage reductions during cold rolling of binary Cu alloys containing Al, Ni, or Zn in solid solution than during rolling of Copper. Alloys in the middle of the solid-solution ranges developed lines at lower percentage reductions than others. No relationship was apparent between strain hardening or eventual rolling texture and initial formation of deformation lines. A possible correlation between the appearance of the lines and the type of rolling texture eventually formed is suggested. 17 ref.

4c-14. Mechanism of Precipitation in Alloys of Beryllium in Copper. A. G.

(Turn to page 16)

150 r.p.m. and 16 feeds from ¼ to 30 in. per min. **Cincinnati Milling Machine Co. (243)**

Four separate operations can be performed progressively on the No. 000-4, which is composed of four individual milling machines mounted on a single base. Table speeds are from 1 to 40 in. per min., and spindle speeds from 500 to 1800 r.p.m. **Cincinnati Milling Machine Co. (244)**

A ram-type milling machine, Model 16, features an adjustable cutter head and movable ram. Horizontal, vertical and angular milling can all be performed with standard milling cutters and conventional milling practices. Most work can be carried through to completion without change in setups. **Van Norman Co. (245)**

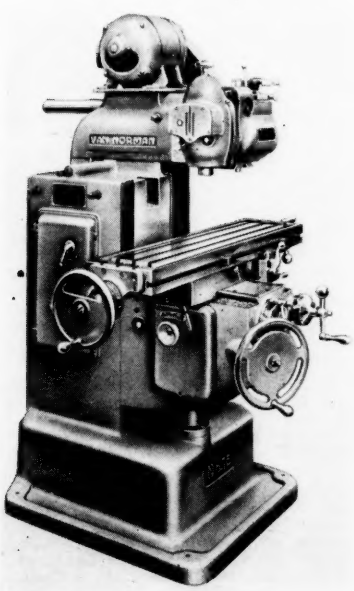
Sundstrand's triplex Rigidmil has three adjustable spindle heads, two of them horizontally opposed, and the third in a vertical position. Spindles can be operated independently. **Sundstrand Machine Tool Co. (246)**

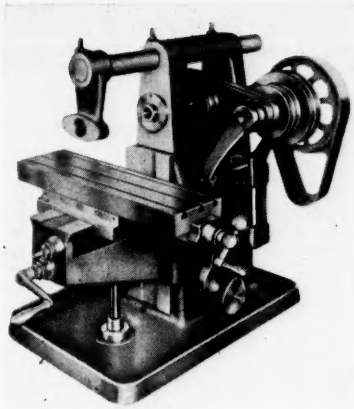
A 450-lb. bench mill with 4 x 20-in. table is one of the largest manufactured. Power is transferred to the spindle by a three-step pulley with double "B" V-belts—a powerful drive for heavy cuts without belt slippage. Longitudinal travel is 12 in., vertical travel 9 in., and transverse travel 6 in. (Literature available.) **Diamond Machine Tool Co. (247)**

A table-type horizontal boring, drilling and milling machine will accommodate work up to 1000 lb. and equivalent to an 18-in. cube in dimensions. It has a tracing attachment for die sinking work and is equipped for precision thread cutting. **Giddings & Lewis Machine Tool Co. (248)**

Another horizontal boring, drilling and milling machine of medium size will take work up to 8000 lb. and a 30-in. cube. Rotary tables and continuous-feed facing heads broaden the working range. **Giddings & Lewis Machine Tool Co. (249)**

Ram-Type Milling Machine, Model 16. Van Norman Co.





Large Bench Mill With 40 x 20-In. Table. Diamond Machine Tool Co.

No. 4D die sinker can be used to produce original forging dies, die-casting dies, molds and similar work. Directron control permits compounding any two components of travel. Working surface of the table is 16 x 43 in. **Pratt & Whitney Division, Niles-Bement-Pond Co. (250)**

A milling and die sinking machine for toolroom work has a universal head that can be adjusted for all angles to 45° front and back, and 30° left to right. **Reed-Prentice Corp. (251)**

Two improved lines of pull-up and pull-down broaching machines and a new line of single-ram surface broaching machines, all of the vertical type, are offered in a complete range of standard tonnages and strokes. Improvements are largely in the hydraulic system layout and the air circulation system. **Colonial Broach Co. (252)**

A double-cylinder hydraulic broaching machine with 360-in. stroke is designed so that two jobs can be set up at one time, one to be worked immediately after the other. **Zagar Tool, Inc. (253)**

Planing, Shaping, Gear Cutting

New mechanical features in a double-housing planer include a magnatic clutch-type feed mechanism. It also has an improved variable voltage motor drive. **Cincinnati Planer Co. (254)**

A Space-Saver drive is a feature of the Gray openside planer cub, available in 24, 30 and 36-in. sizes. The motor is mounted at an angle alongside the column and drives through a full-floating shaft and hypoid gearing. Carbide tools can be used, since speeds run up to a maximum of 300 ft. per min. **G. A. Gray Co. (255)**

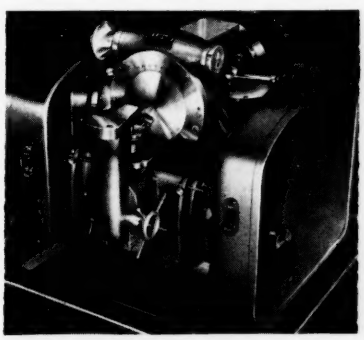
Cams, splines, toothed clutches, ratchet wheels, and sprocket wheels can be cut in one setup on the Shear-Speed line of shapers. The shapes are cut by formed tools which feed in radially from all sides during the cut. Feed is automatically adjusted to balance approximately the cutting load on each stroke. **Michigan Tool Co. (256)**

Sixteen ram speeds, arranged in geometric progression and selected by two gearshift levers, are available in new G & E shapers. The ram has been made wider and strengthened to minimize deflection. **Gould & Eberhardt, Inc. (257)**

A production hobbing machine provides semi-automatic cycling, speed for carbide hobbing, conventional and climb hobbing in either direction. It takes work to 8 in. diameter on some pitches and has hob-slide travel of 12 in. **Barber-Colman Co. (258)**

For general-purpose gear cutting a 36-in. shaper has a one-piece spindle that takes a 5-in. cutter and is operated by a heavy reciprocating mechanism. The cutter can be fed by independently adjustable steps determined by the number and position of dogs. **Fellows Gear Shaper Co. (259)**

A line of high-production crossed-axis rotary gear finishers, consisting of two models in three sizes each, provides three different methods of gear finishing, namely, underpass, transverse and traverpass shaving—the latter a new development representing a combination of underpass and transverse shaving. (Literature available.) **Michigan Tool Co. (260)**



Fine Pitch Gear Generator. Illinois Tool Works

Two or more gears can be finished simultaneously in tandem in an improved rack-type gear finisher. The machine operates hydraulically and has a duplex head and tailstock; one gear can be mounted between centers and another on a stub arbor immediately ahead of the centers. **Michigan Tool Co. (261)**

For producing small, fine-pitch gears to precision tolerances, a new gear generator combines the advantages of both the shaping and hobbing methods. Tool simplification contributes to the accuracy of finished work and economy of operation. While designed primarily for producing fine pitch involute gears, either spur or helical, the machine will generate any form produced by conventional methods. **Illinois Tool Works. (262)**

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Guy, C. S. Barrett, and R. F. Mehl. *Metals Technology,* v. 15, Feb. 1948, T. P. 2341, 23 pages.

Several different techniques were used in the study of the above, including quenching from solution temperature directly to aging temperature; measurement of change of electrical resistance during aging; Tukon hardness testing of grain-center and grain-boundary areas of tricrystals; and Laue and Debye X-ray diffraction, the latter with an improved system. Evidence for acceleration of hardening by strains produced by water quenching, and for the theory that strain is the cause of grain-boundary precipitation, was obtained. It was concluded that the observed behavior can be explained by the same theory used to account for hardening of Al-Cu and Al-Ag alloys. 20 ref.

4d—Light Metals

4d-2. X-Ray Studies of Twinning and Untwinning in Magnesium Alloys. J. B. Hess and R. L. Dietrich. *Metals Technology,* v. 15, Feb. 1948, T.P. 2328, 5 pages.

In order to explain the results of cyclic stressing in alternate tension and compression upon the tangent elastic modulus of the above, Dorn and Thomsen have postulated that, following twinning under applied compression, a retwinning or untwinning occurs as a result of residual microtensile stresses immediately upon removal of the applied compressive force. Carapella and Shaw have used this supposition in discussing results of indentation hardness and cold drawing of Mg sheet. However, the authors have been unsuccessful in detecting any evidence of this phenomenon.

For additional annotations indexed in other sections, see:

2b-33; 3a-7; 3b-12; 6a-10; 8-24; 10b-9; 10c-7; 11-27-31; 14d-9; 18b-11; 19c-7; 22b-58; 27b-16.

5a—General

5a-5. Sieve Test of Metal Powders. Rolla E. Pollard. *Journal of Research of the National Bureau of Standards,* v. 39, Dec. 1947, p. 487-505.

Reproducible results were obtained in sieve tests of sponge iron, electrolytic iron, electrolytic copper, and nickel, only when certain variables affecting the sieving characteristics of the powders were eliminated or controlled. One of these was a cumulative sampling error resulting from repeated riffle cutting of limited powder supplies. Another was the effect of exposure to humid atmospheres. The effects of both variables were demonstrated in tests with sponge iron. Significant variations also were noted when the same powders were sieved with different sets of certified sieves. 22 ref.

5a-6. Apparatus for Air Classification of Metal Powders. E. C. Truesdale. *Proceedings Third Annual Spring Meeting, Metal Powder Association,* 1947, p. 35-50; discussion, p. 50-51.

A laboratory instrument based on air elutriation according to Stokes' Law was developed and found to be capable of accurate fractionation at particle diameters up to 40 microns for spherical particles and to give reproducible results for spherical or nonspherical particles (excepting flakes) up to 75 microns. Modification permitted conversion to a continuous feed, multiple-stage classifier which was capable of sharp particle-size cuts with high recovery of fines.

5a-7. Electrical and Electronic Components From Powdered Metals. Erle I. Shobert, II. *Proceedings Third Annual Spring Meeting, Metal Powder Association,* 1947, p. 57-66.

The discussion is limited to five main types of applications; electrical contacts, metal-graphite brushes, permanent magnets, soft magnetic materials, and high-frequency iron cores.

5a-8. Powder Metallurgy; Review of Progress in 1947. W. D. Jones. *Metal Industry,* v. 72, Jan. 9, 1948, p. 23-24. 28 references.

5a-9. Progress in Powder Metallurgy. E. J. Sandford. *Metallurgia,* v. 37, Dec. 1947, p. 95-99.

Reviews 1947 developments. 47 ref.

5a-10. The Effect of Particle Size on the Electrical Properties of Sintered Materials. Henry H. Hausner. *Powder Metallurgy Bulletin,* v. 3, Jan. 1948, p. 4-8.

Theoretical considerations and experimental results for three groups of Cu powders and for the systems ZrO_2-talc-Cu and ZrO_2-talc-graphite. Results agree closely with theory.

5a-11. Metal Density Assured. *Steel,* v. 122, Feb. 9, 1948, p. 96.

Press equipment for metal powder, in which pressures are applied simultaneously from top and bottom as well as from sides.

5a-12. Factors Governing the Particle Size Grading of Pulverized Materials. R. North. *Industrial Chemist and Chemical Manufacturer,* v. 24, Jan. 1948, p. 5-11.

Results obtained by different techniques.

5b—Ferrous

5b-1. Hot Pressing Metal Powders. *Iron Age,* v. 161, Jan. 22, 1948, p. 60 Based on paper by G. Wassermann in *Metallforschung,* v. 2, 1947, p. 129.

By applying a wash of iron powder and water to the adjacent surfaces of the cold-pressed component parts of a large piece (a large hollow cylinder), and by applying pressure to the top of the piece during sintering, it was possible to sinter the parts into one compact body.

5b-2. Stainless Steel Powder. John D. Dale. *Proceedings Third Annual Spring Meeting, Metal Powder Association,* 1947, p. 4-11; discussion, p. 11-13.

Development in the laboratory of Charles Hardy, Inc. Effects of various factors in the sintering process, physical properties.

5b-3. New Developments in the Production of Metal Powder Parts. E. E. Ensign. *Proceedings Third Annual Spring Meeting, Metal Powder Association,* 1947, p. 14-20.

Some new developments in production of powdered iron parts at Ford Motor Co. Results of preliminary work, equipment and products.

5b-4. Cost Calculations in the Production of Powder Metallurgy Parts. Henry H. Hausner. *Proceedings Third Annual Spring Meeting, Metal Powder Association,* 1947, p. 21-29.

Concerned only with iron-powder parts, although the methods used are no doubt applicable to other powdered metals.

5b-5. Evaluation of the Molding, Coining, and Sintering Properties of Iron Powder. Jerome F. Kuzmick. *Metals Technology,* v. 15, Jan. 1948, T.P. 2308, 20 pages.

Methods for the evaluation are described and results obtained by their application to one grade of Swedish iron powder.

5b-6. Magnetic Properties of Iron Powder Compacts. Robert Steinitz. *Metals Technology,* v. 15, Feb. 1948, T.P. 2335, 11 pages.

Results of a systematic experimental study. It is shown that the raw material has negligible effect on properties if compared for identical densities rather than for identical processing procedures. A theory for the effect of sintering temperature is proposed.

5b-7. Nickel Steels by Powder Metallurgy. Laurence Delisle and Walter V. Knopp. *Metals Technology,* v. 15, Feb. 1948, T.P. 2340, 20 pages.

Metal powders, in the proportion corresponding to S.A.E. 2330 steel, were mixed with graphite, pressed, and sintered at different temperatures up to 1325° C. and for different periods of time up to 6 hr. It was found that diffusion was incomplete unless sintering were carried out at a high temperature for much longer periods. Since such a procedure is commercially impracticable, production of a special structure consisting of a hard constituent, rich in nickel, dispersed in a tough pearlitic matrix by means of partial diffusion, was attempted. Diffusion was found to take place sufficiently to change the mechanical properties of the steel markedly as compared to plain carbon steel. Advantage can be taken of partial diffusion of Ni to obtain a hardened structure on sintering followed by rather slow cooling, without additional conventional heat treatment.

5c—Nonferrous

5c-4. Bearings, Bushings and Allied Products. A. J. Langhammer. *Proceedings Third Annual Spring Meeting, Metal Powder Association,* 1947, p.32-34.

Properties and design principles of powder metallurgy bearings and other parts.

5c-5. Copper Lead Bearings From Metal Powder. E. R. Darby. *Proceedings Third Annual Spring Meeting, Metal Powder Association,* 1947, p. 52-54; discussion, p. 54-56.

Production of steel-backed Cu-Pb bearings. The alloy contains 20 to 45% Pb and usually less than 1½% of other elements. It is very difficult to cast, hence the use of the special metal-powder process developed by Federal-Mogul Corp. is very helpful.

5c-6. Manufacturing Bronze, Aluminum or Other Flake Metal Powders. Henry F. Mandle. *British Intelligence Objectives Sub-Committee, FIAT Final Report* No. 569, Dec. 27, 1945, 53 pages.

Military investigation of German industries.

5c-7. Pulverisation Fine des Cupro-Plomb. Fabrication des Coussinets Minces. (Fine Pulverization of Cupro-Lead. Manufacture of Thin Bearings.) René Delaplace. *Comptes Rendus* (France), v. 225, Dec. 1, 1947, p. 1075-1076.

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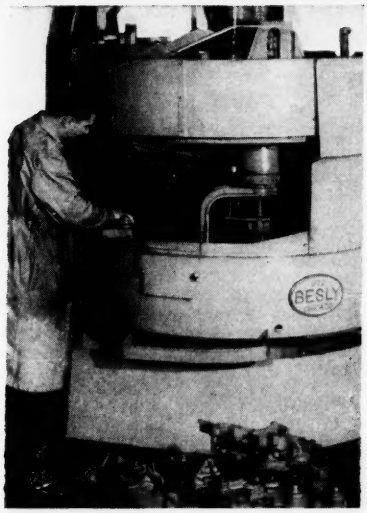


Grinder for Cast Iron Gear Housings. Charles H. Besley and Co.

Grinding*

A hydraulic surface grinder is designed for heavy stock removal on large areas to the degree of finish and accuracy required for machine tool bearing surfaces. It is 36 x 48 x 120 in. and has a "super-precision" spindle powered with a 40-hp. motor. **Thompson Grinder Co. (263)**

Another Thompson surface grinder has coolant applied through the grinding wheel so that extremely thin sections can be ground without burning. **Thompson Grinder Co. (264)**

An 8 x 24-in. hydraulic surface grinder is designed for toolroom or light production work. It has horizontal spindle, hydraulic and hand table traverse and automatic hydraulic cross feed. The latter feature is for easy adjustment and accurate, smooth operation. **Norton Co. (265)**

The 10 x 20-in. universal grinding machine has interchangeable belts in the wheel head so that a cylindrical grinding wheel can be mounted on either end of the work spindle. **Norton Co. (266)**

A machine designed especially for grinding and sharpening cutters and tools has a wheel head that can be tilted up to 15° each side of horizontal, and also may be swiveled through 360°. **Norton Co. (267)**

New cyindrical grinders are available in various sizes with both plain hydraulic and semi-automatic arrangements. All of them include hydraulic power table traverse with automatic wheel feed and adjustable table dwell control at each table reversal. **Norton Co. (268)**

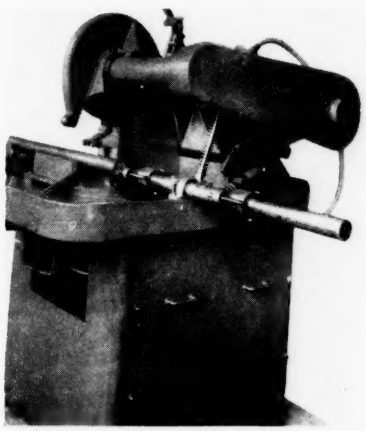
*This section is confined to machines whose primary purpose is stock removal. Machines designed more particularly for fine surface finishing will be treated in the June issue of *Metals Review*, which will be devoted to cleaning and finishing. Grinding and buffing wheels will also be considered in that issue.

An automatic cylindrical grinder handles straight or tapered diameters on work which can be held in centering devices. It grinds by the straight-in or plunge-cut feed method. Work is fed by indexing turret. **Arter Grinding Machine Co. (269)**

New models of centerless internal grinding machines are for mass-production grinding of parts that can be rotated on their outside diameters while grinding the bore. Work up to 9 in. o.d. can be handled, and holes up to 6 in. long can be ground. **Heald Machine Co. (270)**

A 72-in. vertical spindle grinder is designed for production grinding of cast iron gear housings. The casting is placed in a power-driven rotary fixture which carries it through the grinding cycle at one revolution every minute. Four pieces are ground simultaneously. **Charles H. Besly and Co. (271)**

A Projectoform grinder incorporates an optical system which uses either contour or opaque projection with surface illumination. The image



Tabor Cutoff Machine

is in its natural position. Magnification may be either 25X or 50X. **Sheffield Corp. (272)**

Use of wet belt machining to remove 1/16 to ⅛ in. of stock from a 1½-in. thick cast aluminum gear housing stepped up production from 43 to 167 pieces per hr. The machine used was a BG-8 model with a simple work-holding device consisting of a pin that fits into the bearing hole of the gear housing. **Porter-Cable Machine Co. (273)**

In a new Porter-Cable model, the C-6, a flexed abrasive belt approaches and leaves a formed contact roll at a slight angle. The belt "drapes" itself into the pattern on the contact roll, which is made of sisal and latex. **Porter-Cable Machine Co. (274)**

A bench-type high-speed profile grinder can be used on interior and exterior profiles, curved, odd and irregular surfaces. Features are a functional work table with four-way 15° tilt, a built-in diamond dresser, and spindle speed of 20,000 r.p.m. **Milwaukee Chaplet & Mfg. Co. (275)**

New Microhoning machines known as Hydrohoners are heavy-duty, multiple-spindle machines that can produce more than 500 parts per hr. with less than 0.0003 in. variation in size and less than 0.0005 in. out-of-roundness or taper. The spindles are mounted in quills and each quill is actuated as an independent unit. This design eliminates the necessity of guide bars. **Micromatic Hone Corp. (276)**

Two automatic sizing devices have been introduced on Microhoning machines. Two Thyratron electronic tubes are used as the control of the Microsize device, one a trigger tube and the other a timer tube. With the Hydrosize control, an air gage is built into the honing tool. Pressure drops in proportion to the stock removed from the bore; at a predetermined point the honing cycle is completed automatically. **Micromatic Hone Corp. (277)**

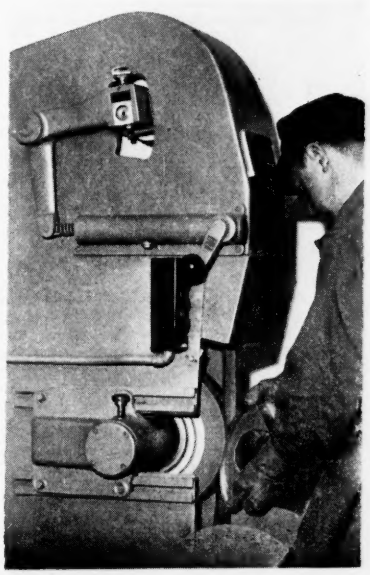
Written as an operator's instruction manual and as a repair and maintenance guide, a 48-page "Cutter Grinder Catalog" explains in detail the procedure for sharpening milling cutters with carbide, cast alloy or high speed steel blades. **Ingersoll Milling Machine Co. (278)**

Cutoff and Filing; Saws

An abrasive cutoff machine for toolroom and job shop work where fast cutting is necessary, and a second machine designed primarily for the production line, have been added to the DoAll line. The first has a 10-in. wheel mounted on a swinging arbor, powered by a 3-hp. motor, for dry cutting, and the second uses a 16-in. wheel and a 7½-hp. motor, and includes a coolant tank and pump for wet cutting. (Literature available.) **DoAll Co. (279)**

Adequate power to maintain proper wheel speed in cutting any quan-

Porter-Cable Abrasive Belt Machine

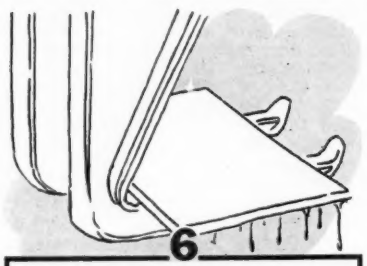


For Bulletins and Further Information, Use Reader Service Coupon on Page 23

Methods for preparing Cu-Pb powder from pure copper and lead. Sintering the powder for use in bearings.

For additional annotations indexed in other sections, see:
4a-11.

AMERICAN IRON POWDERS
By the pound, ton or carload
SUPERIOR METAL POWDERS CORP.
1011 Pelee Street Toledo 7, Ohio



6 CORROSION

6a—General

6a-9. Corrosion in Boiler Feedwater Treating Systems—IV. (Concluded.) Leo F. Collins. *Power Generation,* v. 52, Jan. 1948, p. 106, 108.

Systems employing zeolite, acids, and degasification. Results of tests made to evaluate comparative corrosion resistance of materials used in deaerating heater trays, vent condenser tubes, and water heater tubes.

6a-10. L'Oxydation des Métaux. (Oxidation of Metals). N. F. Mott. *Journal de Chimie Physique et de Physico-Chimie Biologique,* v. 44, Aug.-Sept. 1947. p. 172-180.

Assumes that metallic ions pass through the oxide layer to react with oxygen on the surface of the layer. This idea is examined mathematically for a compact metal film, either amorphous or crystalline. 13 ref.

6a-11. Corrosion of Metals With Oxygen Depolarization. *Light Metals,* v. 11, Jan. 1948, p. 8-14.

Continues condensation, with commentary, of Russian book by N. D. Tomashoff. Analytical method for calculating rate of corrosion processes; factors controlling rate of corrosion. (To be continued.)

6a-12. Sodium Chloride Versus Construction Materials. Part IV. (Concluded.) *Chemical Engineering,* v. 55, Jan. 1948, p. 223-224, 226, 228, 230, 232, 234.

Chemical Stoneware, by F. E. Herstein; Haveg, by E. P. Mampe; Durimet and Chlorimet, by Walter A. Luce; Aluminum, by Joseph P. Balash; Hastelloy, by C. G. Chisholm; Stainless Steel, by Grant L. Snair, Jr.

6a-13. Use of Inhibitors in Corrosion Control. Norman Hackerman. *Corrosion,* v. 4, Feb. 1948, p. 45-56; discussion, p. 56-60.

Use of a number of specific materials show that the effectiveness of a material as an inhibitor in one instance does not make it generally applicable. Theories of corrosion inhibition—particularly the relation of absorption to such action. 59 ref. (Presented at Annual Meeting of N.A.C.E., Chicago, April 7-10, 1947.)

6a-14. Corrosion Problems in Communication and Radio Equipment Design. L. P. Morris. *Corrosion,* v. 4, Feb. 1948, p. 61-71.

A general discussion, including the action of fungi and methods for prevention by use of coatings. (Presented at Annual Meeting of N.A.C.E., Chicago, April 7-10, 1947.)

6a-15. Oleophobic Monolayers. II. Temperature Effects and Energy of Adsorption. W. C. Bigelow, E. Glass, and W. A. Zisman. *Journal of Colloid Science,* v. 2, no. 6, 1948, p. 563-591.

Experimental methods for observing the effect of temperature on oleophobic films adsorbed from solution. Observed effects are discussed and a quantative kinetic treatment of them, in terms of adsorption-desorption equilibria, is given. The relationship of the observations and conclusions to fundamental aspects of adsorption from solution, corrosion inhibition, and wear prevention are discussed. 20 ref.

6a-16. Relationships of the Phases in Systems of Water Solutions and Metals. (In Russian.) A. I. Shultin. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 20, Aug. 1947, p. 739-753.

An extensive experimental investigation revealed that the oxidation-reduction properties of solutions depend not only upon the nature of the dissolved substance but also upon the pH. The chart of pH vs. Redox potential is used to estimate the corrosivity of different solutions toward different metals.

6b—Ferrous

6b-8. Rust Preventives; How They Work, What They Contain. Helen Sellei. *Chemical Industries,* v. 62, Jan. 1948, p. 62-64.

42 references.

6b-9. A Study of Films Isolated From Passive Stainless Steels. E. M. Mahla and N. A. Nielsen. *Journal of the Electrochemical Society,* v. 93, Jan. 1948, p. 1-16.

By use of a bromine-methanol solution, the authors have been able to isolate passive films from electrolytic chromium, ferritic, and austenitic stainless steel, and from the alloys Nichrome V and Inconel. These films were examined by both light microscopy and electron microscopy and by electron diffraction. Structures and compositions identified. (Prepared for delivery at Columbus, Ohio, meeting, April 14-17, 1948.)

6b-10. Inhibition of Steel Corrosion by Sodium Nitrite in Water. Morris Cohen. *Journal of the Electrochemical Society,* v. 93, Jan. 1948, p. 26-39.

Results of a study of the above test methods which included total and alternate immersion, a recirculation apparatus, and potential measurements. The concentration required to inhibit steel corrosion depends on conditions of motion and temperature and the inhibiting effect can be interpreted by solution-potential measurements. The mechanism of inhibition is believed to be the formation of a protective oxide coating. (Prepared for delivery at Columbus, Ohio, meeting, April 14-17, 1948.)

6b-11. Gas Utility Underground Pipe Corrosion Mitigation Practices. A. H. Cramer. *Corrosion,* v. 4, Feb. 1948, p. 72-82.

Methods followed by a gas-distributing company in urban and suburban areas. (Presented at Annual Meeting of N.A.C.E., Chicago, April 7-10, 1947.)

6b-12. Soluble Silicates for Corrosion Inhibition in the Oil Industry. Wm. Stericker. *Corrosion,* v. 4, Feb. 1948, p. 83-92.

A number of case histories and conclusions which will serve as guides in the use of silicates elsewhere. (Presented at annual meeting of N.A.C.E., April 7-10, 1947.)

6b-13. Carbon Steel Gives Good Service in Processing Sour Crude Oils. *Petroleum Processing,* v. 3, Feb. 1948, p. 111-113.

Results of inspection of Leonard Refineries' 3000-bbl. per day TCC unit, after a 222-day run on reduced crudes containing about 0.9% sulphur.

6b-14. Maintenance of Stainless Steel Equipment in Refineries. Article 2—Stress and Local Corrosion, Wear and Abrasion, and Cleaning Methods. W. G. Renshaw. *Petroleum Processing,* v. 3, Feb. 1948, p. 155-156, 159-160.

6b-15. What to Look for in Hydraulic Oils—Part VII. Noncorrosive Qualities. Anthony J. Zino, Jr. *American Machinist,* v. 92, Feb. 12, 1948, p. 126-128.

Tests for determining above properties. (Concluded.)

6b-16. Temporary Rust Prevention Treatments. *Agricultural Engineering Record,* Winter 1946-7. p. 180-184.

Various treatments were evaluated by applying a series of commercial products to parallel sections of a steel plow moldboard and exposing it to the weather for several months.

6b-17. Cast-Iron Crucibles; Corrosion by Molten Aluminum. Marcel Bardot. *Iron and Steel,* v. 21, Jan. 1948, p. 23-26. Translated from *Fonderie,* Sept. 1947, p. 798-810.

A summary of a bibliographic study preparatory to further research. Original previously abstracted. See item 6-323, R.M.L., v. 4, 1947. (To be concluded.)

6c—Nonferrous

6c-1. The Corrosion of Silver in a Water Saturated Chlorine Atmosphere. Henry B. Linford and Michael J. Ford. *Journal of the Electrochemical Society,* v. 93, Jan. 1948, p. 16-26.

The corrosion of 99.9% silver in a saturated chlorine atmosphere was studied. Effects observed are explained on the basis of concentration of active agent and diffusion through the film of silver chloride of the active agent.

6c-2. Tests, Properties of Corrosion-Preventive Lubricants for Lead-Sheathed Cables in Underground Ducts—A Discussion. Howard S. Phelps and Frank Kahn. *Corrosion,* v. 4, Feb. 1948, p. 37-44.

Desirable specifications for the lubricants and some special test procedures developed for their evaluation. Method of application. (Presented at Annual Meeting of N.A.C.E., Chicago, April 7-10, 1947.)

6d—Light Metals

6d-1. The Corrosion of Metals—Part VIII. Aluminum and Its Alloys. (Continued). *Sheet Metal Industries,* v. 25, Jan. 1948, p. 135-142.

Continues review of recent developments reported in the literature.

6d-2. Observations Relatives a l'Influence de l'Ecrouissage sur le Potentiel de Dissolution de l'Aluminum. (Observations Relative to the Effect of Cold Working on the Solution Potential of Aluminum.) Y. Druet and P. A. Jacquet. *Métaux et Corrosion,* v. 22, Sept. 1947, p. 139-141.

Cold work makes the dissolution potential of extra pure aluminum more electronegative in a 3% NaCl solution. For verification and extension of these observations further tests are now under way. 11 ref.

For additional annotations indexed in other sections, see:
3b-23; 6b-16; 18b-18-19-20-21-22.

(Turn to page 20)

tity of metal is supplied by an enclosed, fan-cooled 10-hp. motor in a new abrasive cutoff machine. A quick-acting clamp speeds production of cuts. **Tabor Mfg. Co. (280)**

A wet model horizontal band saw, 10 x 18 in. capacity, plays the coolant directly on the cut by having the nozzle fastened to the back of the front saw guide. The pump can be disconnected for dry cutting if desired. (Literature available.) **Johnson Mfg. Corp. (281)**

A heavy-duty horizontal band saw features an automatic cutting cycle in which the blade is fed into the work at constant pressure and the cutting head is returned by hydraulic power to its starting position above the work upon completion of the cuts. **Wells Mfg. Corp. (282)**

The Cut-Master, a radial saw for all-purpose cutting, has a calibrated scale for miter, rip and bevel cutting. A kickback device with multiple dogs is a safety feature for ripping. (Literature available.) **DeWalt, Inc. (283)**

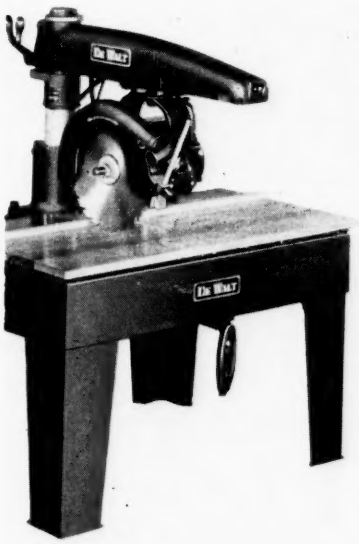
By converting a standard Walker-Turner radial cutoff machine to an automatic grooving unit, S. K. Wellman Co. is able to make eight radial grooves on each side of a powder metal disk at a rate of three pieces per min. The machine is equipped with a diamond-impregnated metal wheel and a magnetic chuck mounted on an automatic index table. **Walker-Turner Co., Inc. (284)**

A bench-type reciprocal filing machine has a work table that can be tilted four ways up to 15° in any direction. The surface of the table is serrated for collecting chips and filings. **Milwaukee Chaplet and Mfg. Co. (285)**

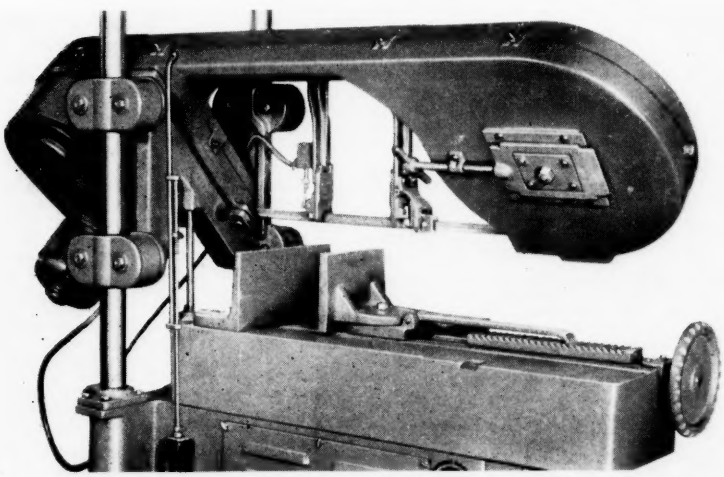
Profiling machines for turning, boring, chamfering, burring, threading, and tapping on ends of pipe, tubing, bars, and fittings may be either manual or automatic. Automatic types are equipped with hydraulic controls which repeat the machining sequence continuously. With two heads both ends of the work can be machined simultaneously. (Literature available.) **Pines Engineering Co. (286)**

With the Red-E-Haul portable pipe threading machine it is possible to cut, chamfer, ream and thread any pipe from ½ to 2 in. without changing dies. The flip of a lever selects the size instantly. Built-in tool tray and handy dope cup are other features. (Literature available.) **American Die & Tool Co., Inc. (287)**

Cut-Master Radial Saw. DeWalt,Inc.



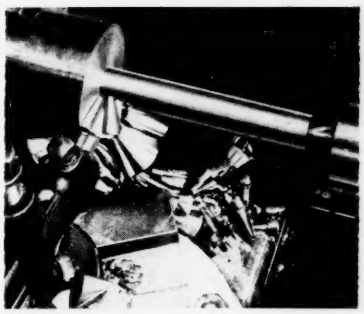
Below: Heavy-Duty Horizontal Band Saw. Wells Mfg. Corp.



The Tools

Tool Materials; Bits

A new carbide composition, Kennametal Grade K138, consisting essentially of titanium carbide with cobalt as the bonding element, has been developed to retain strength and corrosion resistance at high temperatures. Pieces of it have been heated to 2100° F. for 48 hr. without loss of strength. Specific gravity is about one-third that of tungsten carbide. **Kennametal, Inc. (288)**



3/8-In. Shearcutter Bit Taking 1 1/8-In. Cut Under Power Feed in Cold Rolled Steel

A new grade of Willey's Metal known as 606 is a universal material that can be used for machining all types of steel. It can be furnished in standard tools, specials or blanks. **Willey's Carbide Tool Co. (289)**

Three more cemented carbide products—solid disks in 10 sizes, disks with holes in 12 sizes, and solid strips in 21 sizes are now available as standard stock items from the **Carboloy Co., Inc. (290)**

A new line of mechanically held tools called Kendex have flat, indexable tips held to the shank with countersink screws and prevented from turning by carbide particles embedded on the under side. Tools are available in shank sizes of ½, ⅝, ¾ and 1 in. square, with round, square, triangular, and pentagonal Kennametal tips. **Kennametal, Inc. (291)**

A roughing roll-turner for chilled cast iron rolls is composed of a series of replaceable solid Kennametal cemented carbide disks secured to a heat treated shank and backed by a hardened steel plate. Two quick cuts produce a scalloped surface, to be smoothed with a block type of finishing tool. **Kennametal, Inc. (292)**

Third in a series of ejector-type tools is an offset tool to supplement the previous straight and vertical types. In the ejector toolholder an insert of solid carbide is held without clamping strains, and the chips do not interfere with the clamping mechanism. Screw blade advancement, longer blade life and easy sharpening are advantages. (Literature available.) **Super Tool Co. (293)**

New presharpened Shearcutter tool bits are made from 18-4-1 high speed steel with 10% cobalt added. Because of the knifelike, shearing action of the tool, depths of cut can be up to three times the nominal size of the tool bit used. **Shearcut Tool Co. (294)**

A ratio recessing tool for grooving, back facing and recessing is designed for operation on high-speed automatic machines. Cutters of the tool move in a radial direction in a predetermined ratio ranging from three to eight times more slowly

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7 CLEANING and FINISHING

7a—General

7a-29. New Synthetic Finish for Ferrous and Nonferrous Metals. Carl L. Shapiro. *Materials & Methods,* v. 27, Jan. 1948, p. 62-64.

Chemical pretreatments and primer coats can be eliminated in finishing metals by use of a new vinyl-type coating which dries in from 2 to 20 min. at 300° F.

7a-30. Product Painting in a Custom Shop. C. F. Swanson. *Industrial Finishing,* v. 24, Jan. 1948, p. 58-60, 62, 64, 66.

Layout and operation of equipment for finishing diversified products.

7a-31. Review of Organic Finishing—1947. Ferdinand C. Wehrman. *Organic Finishing,* v. 9, Jan. 1948, p. 9, 12-13, 16-17.

7a-32. Advances in Cleaning Compounds. D. R. Swan. *Organic Finishing,* v. 9, Jan. 1948, p. 19-25.

Developments in chemical cleaners for metal surfaces.

7a-33. Wrinkle Finishes Applied Electrostatically. Herbert Chase. *Organic Finishing,* v. 9, Jan. 1948, p. 33, 36-37.

Finishing of metal products at International Business Machines Corp., especially in applying a black wrinkle finish by means of an electrostatic spray set-up.

7a-34. Modern Methods in Paint Spray Booth Practice. *Sheet Metal Worker,* v. 39, Jan. 1948, p. 99-100, 109.

7a-35. Aircraft Finishes. R. J. Ledwith. *Journal of the Oil & Colour Chemists' Association,* v. 30, Dec. 1947, p. 503-515; discussion, p. 515-518.

The special characteristics of aircraft finishes. The principal D.T.D. specification finishes for the materials used in aircraft construction, namely wood, fabric, and metal. An evaluation of performance in meeting these requirements and the limitations of specifications. Recent developments.

7a-36. The Assessment of Ships' Paints for Use in the Royal Navy. C. D. Lawrence and G. E. Gale. *Journal of the Oil & Colour Chemists' Association,* v. 30, Dec. 1947, p. 519-548; discussion, p. 549-556.

Anticorrosive and antifouling paints for ships' bottoms; weatherwork and camouflage paints; fire-retardant paints; deck paints; anti-condensation paints for use under humid conditions. 17 ref.

7a-37. Powder Welding. Clyde B. Clason. *Welding Engineer,* v. 33, Feb. 1948, p. 60, 62.

Use of two separate gases to project powdered metals, rubbers, enamels, and other materials under cover of controlled atmospheres of any type desired. The process may be applied to flame spraying of metals and nonmetallics with compressed air; powder welding by controlled atmosphere projection; nonpowder welding in a controlled atmosphere; and brazing and soldering in a controlled atmosphere.

7a-38. Hazard Survey of a High-Voltage Electrostatic Process for Spray-Deposition and Dip-Detearing of Paints. *National Board of Fire Underwriters, Research Report* No. 6, 1947, 40 pages.

Theory of operation of the process, design and construction of the equipment used; layout and installation of typical assemblies. A review of the ordinary and special hazards involved in the spraying and detearing arrangements, and a resume of existing codes and precautionary measures. 39 ref.

7a-39. The Cleaning of Metals—II. Alkaline Cleaners. R. Groves. *Metallurgia,* v. 37, Dec. 1947, p. 100-102.

Principal applications; specific operations; procedural details.

7a-40. Metal Conservation in Europe; Progress of Phosphating. *Metallurgia,* v. 37, Dec. 1947, p. 105-106.

A brief review.

7a-41. Beneficiation of Over-Spray Porcelain Enamel. (Concluded.) Donald W. Scott, L. A. Roe and B. J. Sweo. *Ceramic Age,* v. 51, Jan. 1948, p. 18-19, 27.

Previously abstracted from *Mining Technology,* v. 11, Sept. 1947, T.P. 2253. See item 7-405, R.M.L., v. 4, 1947.

7a-42. Preservation of Grained Plates. Robert E. Rossell. *Modern Lithography,* v. 16, Jan. 1948, p. 49, 91, 93, 95, 97, 99.

Tropical and sub-arctic testing of lithographic equipment, supplies, and processes by the Photo & Lithographic Branch of the Engineer Research and Development Laboratories. In addition to the testing of preservative coatings on both zinc and aluminum plates, a description of the tropical testing chamber is also given.

7a-43. Finishing Clinic. Allen G. Gray. *Products Finishing,* v. 12, Feb. 1948, p. 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64.

Reviews the following: Organic Coatings for Corrosion Protection, by George W. Seagren at 3rd Annual Symposium on Modern Metal Protection; Sources of Impurities in Plating Solutions, by Myron B. Diggin in *Monthly Review,* Nov. 1947; Addition of Alumina to Porcelain-Enamel Frits to Improve High-Temperature Corrosion Resistance, by W. N. Harrison at 3rd Annual Symposium on Modern Metal Protection; and Electrographic Printing of Pores in Protective Coatings (A Method for Evaluating Porosity) described by W. E. Shaw and E. T. Moore, *Analytical Chemistry,* Oct. 1947.

7a-44. Barrel Finishing of Metal Products. Part 18—Continuation of the Discussion of the Origin of Finishing Materials Used in Barrels. H. Leroy Beaver. *Products Finishing,* v. 12, Feb. 1948, p. 70, 72, 74, 76, 78, 80, 82.

7a-45. Stripping of Rhodium Plating. M. Shapiro. *Metal Finishing,* v. 46, Feb. 1948, p. 56-58, 64.

Two methods that have been developed to remove rhodium plate from nickel-plated brass or copper.

7a-46. The Cleaning of Metals. Part III—Further Operations. R. Groves. *Metallurgia,* v. 37, Jan. 1948, p. 147-149.

Cleaning buffed and polished parts for electroplating. Degreasing solvents, their advantages and drawbacks; cleaning by petroleum distillates.

7b—Ferrous-Base Metals

7b-12. The Metallizing Process. Part II—Applications. Rick Mansell. *Steel Processing,* v. 34, Jan. 1948, p. 23-25, 44.

Use in Diesel engine maintenance; in foundries; in babbitt work; in repair of cavitated areas, especially on the blades of hydro-electric turbines; for pump rods and plungers; miscellaneous applications. Performance data and application methods are outlined for a few cases, giving suitabilities of different types of deposits.

7b-13. Zinsco Organic Finishing System Operates Under Close and Varied Controls. *Industrial Heating,* v. 15, Jan. 1948, p. 101-102, 104, 106, 108, 110-111, 174, 176, 178.

System for finishing a large variety of metal boxes and other parts for electrical switchgear, switchboards, and panelboards.

7b-14. New Porcelain Enameling Techniques. G. H. McIntyre. *Enamelist,* v. 25, Jan. 1948, p. 7-11, 60, 62.

High-speed blue ground coats; titanium-base cover-coat enamels; one-fire enamel combinations. (Presented at 15th Annual Convention, Institute of Cooking and Heating Appliance Manufacturers, Cincinnati, Ohio, Dec. 1-3, 1947.)

7b-15. A New, Synthetic Finishing System for Southern Household Products Co., Inc. B. L. Gamble. *Enamelist,* v. 25, Jan. 1948, p. 18-23, 58.

Procedures and equipment for enameling porch and lawn furniture, cabinets, kitchen ensembles, and other steel specialties.

7b-16. How Silk Screen Signs Are Made at California Enameling Company. Fred M. Burt. *Enamelist,* v. 25, Jan. 1948, p. 24-30.

Production of porcelain-enameled steel signs.

7b-17. How Kaiser-Frazer Cars Are Painted. T. C. Jennings. *Industrial Finishing,* v. 24, Jan. 1948, p. 34-38, 43-44, 46.

A cleaning, bonderizing, rinsing, and oven-drying set-up precedes the beginning of car painting, which includes prime coating, sealing of all welded joints, oven drying, wet sanding, and final enamel coating.

7b-18. Finishing National Cash Registers. Part II. (Concluded.) *Industrial Finishing,* v. 24, Jan. 1948, p. 54-56.

Technique of applying solid-color bake enamels, in both smooth and wrinkle finishes on bonderized, prime-coated metal cash registers.

7b-19. 1300° F. Molybdenum Enamels. Karl Kautz. *Better Enameling,* v. 19, Jan. 1948, p. 10-11, 36.

Results of further research on several typical enamels of the above type which were first reported by the author in 1941. Percentage compositions are given.

7b-20. Phosphate Coating on Metal Resists Corrosive Influences. Norman P. Gentieu. *Production Engineering & Management,* v. 21, Jan. 1948, p. 43-45.

How galvanic corrosion of ferrous metal surfaces can be greatly retarded by phosphate treatment before the final finishing operation.

7b-21. The Protection and Finish of Pressed Steel Kitchen Equipment. W. F. Coxon. *Sheet Metal Industries,* v. 25, Jan. 1948, p. 122-124.

Surface cleaning and passivation; solvent cleaning; chemical cleaning; glazing; application of rust-inhibiting priming coats and finishing coats.

7b-22. Gas Consumer Demands of the Enameler. E. W. B. Dunning. *Gas Times,* v. 54, Jan. 2, 1948, p. 34, 36.

Enameling of domestic gas appliances and prevention of manufacturing defects and defects occurring during use.

7b-23. Phosphating Processes for Surface Treatment of Iron and Steel. *Paint Manufacture,* v. 18, Jan. 1948, p.

(Turn to page 22)

than the forward movement of the spindle so as to maintain the proper cutting feed. A new catalog describes the complete Maxwell line of recessing tools. **Maxwell Co. (296)**

A metal turning and cutting tool that can be used to convert drill presses, woodworking lathes and grinder stands into precision metalworking lathes is known as Tru-Turn. The tool has a built-in micrometer and is accompanied by ⅜ and ¼-in. guide bushings and three bits for aluminum, steel and brass. **Millholland Screw Products Corp. (297)**

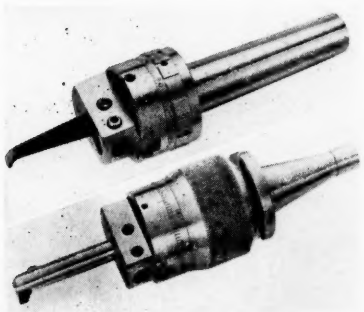
The Redhard precision kit contains 12 tool bits in three grades of metal —high speed steel, nonferrous and carbide (the latter two being tipped tools). Sizes are from 3/16 to ⅜ in. square. **Redhard Metals, Inc. (298)**

Boring Tools

Boring bars made of solid Carboloy cemented carbide are 2.8 times as rigid as steel. Because of this rigidity holes having a length-to-diameter ratio as high as 8 to 1 can be precision bored. **Carboloy Co., Inc. (299)**

A combination tool set of boring bars and accessories saves handling time. Micrometer fly cutter tools, an offset boring and facing head, jacks, parallels and adapters are included in a typical set. **Davis Boring Tool Division, Giddings & Lewis Machine Tool Co. (300)**

The Shearcutter boring, turning and facing tool carries a circular cutter bit so made that 20 to 50 new, sharp cutting edges may be presented to the work by simply rotating the bit. Penetration angle is such that a shearing action is attained which gives a mirror finish with greatly reduced heat of friction. **Shearcut Tool Co. (301)**



Maxwell Boring and Facing Tools

Two new series of boring and power facing tools have interchangeable shanks and can be employed in any jig bore, boring mill, automatic, or drill press. The boring tool is available in three models to hold boring bars of ½, 1 and 1½ in. each. Boring range is from ⅜ to 20 in. **Maxwell Co. (302)**

A high speed steel counterbore known as the Lifetime has two advantages: (*a*) The blades are approximately five times as long as most counterbores, giving unusually long life; and (*b*) a radial ground sub-land pilot is built into the entire length of the tool, so that as blades are sharpened, a pilot already ground to size is automatically developed. **Mohawk Tool Co. (303)**

Drills and Reamers

A center drill of long tool life has a 22° spiral which gives a shearing action and cuts a much smoother hole. A fillet at the point where the 60° countersink angle meets the tip removes stress and strain—an important cause of tip breakage. **Reltool Corp. (304)**

When it is necessary to drill holes in dies, fixtures or other parts that have already been hardened, a new line of standard carbide-tipped drills has shown excellent results on deep holes regardless of the hardness of the steel. They may be used either dry or with coolant. (Literature available.) **Super Tool Co. (305)**

Ream-Rite carbide-tipped reamers, available from stock in ¼ to ⅝-in. sizes, are designed for automatic and hand screw machines and work that does not require a long flute to operate through bushings. **Super Tool Co. (306)**

A patented rolling process is used in the manufacture of high-speed reamers to secure cutter blades of high speed steel in recesses of a tool body of low-carbon steel. The process does not involve heat, as in welding or brazing. **U. S. Tool and Mfg. Co. (307)**

Milling Cutters

Axial face Kennamill for cast iron is of rigid, solid blade construction and can be mounted on all common spindles with bolt circle provided to order. The body is shaped so that a 45° corner angle can be ground for milling light cored sections. **Kennametal, Inc. (308)**

Willey's axial face mill for cast iron is available in cutter diameters from 4¼ to 14 in. and with 8 to 28 blades. Blades are of solid carbide, ground on three sides. (Literature available.) **Willey's Carbide Tool Co. (309)**

An improved grind for making heavy side and face milling cuts with solid carbide inserted-blade cutters is designated the Bi-Axial grind. A combination of negative radial and two negative axial rake angles has a "centering" effect on the cutter, stabilizing the pressure and eliminating flutter. **Super Tool Co. (310)**

Grinding Tools; Saw Blades

A new centerless grinder work rest blade combines the hardness of tungsten with the strength of steel. Sectional inserts of tungsten carbide at the wearing surface are separated by thin strips of a special alloy and laid in a slot with supporting walls of steel. Thus, it provides a tungsten carbide surface for rough grind, but lasts longer than a straight carbide blade in finish grinding. **Cliff Co. (311)**

A carbide burr for internal grinding, jig grinding, and fine finishing by offhand grinding works equally well on soft materials or on steels, hardened to Rockwell C-65. It is stocked in standard sizes from 1/16 to 3/4-in. tool diameter. (Literature available.) **M. A. Ford Mfg. Co., Inc. (312)**

A new standard line of carbide-tipped circular saws includes both standard tooth and fine tooth saws, in six diameters ranging from 8 to 18 in. **W. F. Meyers Co., Inc. (313)**

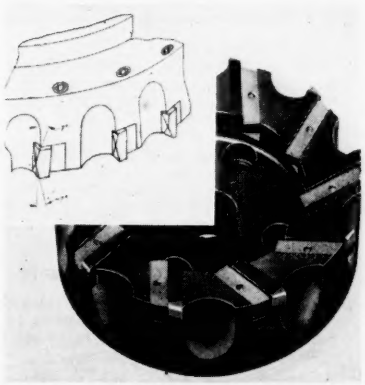
A spiral of hardened teeth around a saw band gives a 360° cutting edge so that material can be cut in any direction without rotating the work. Special rubber roller saw guides keep the blade in perfect alignment. (Literature available.) **DoAll Co. (314)**

Reltool circular slitting saws are designed specifically for cutting plastics and light metals. They are hollow ground with a deeper, dish clearance on the sides to eliminate friction, reduce galling and generate less heat. **Reltool Corp. (315)**

Cutting Fluids

A universal cutting fluid suitable for some 85% of metalworking jobs is known as Cimcool. It is a chemical emulsion which forms a cutting fluid when diluted in water; a physical change takes place in the fluid itself when it contacts the cutting tool. **Cincinnati Milling Machine Co. (316)**

Sunicut all-petroleum cutting oils are made with a new ingredient called Petrofac which supplants animal and vegetable fats in the formula. This ingredient will not turn rancid nor support bacterial growth; it imparts superior metal-wetting, chip antiweld and extreme pressure characteristics. (Literature available.) **Sun Oil Co. (317)**



Inserted-Blade Milling Cutter With Bi-Axial Grind. Super Tool Co.

Lusol is a liquid concentrate used with 10 to 75 parts of water to form

For Bulletins and Further Information, Use Reader Service Coupon on Page 23

19-20. Based on B.I.O.S. Final Report No. 1298 (Item No. 21).

Summarizes German practice.

7b-24. New Enameling Techniques. G. H. McIntyre. *Stove Builder*, v. 13, Feb. 1948, p. 47-52, 54.

Reviews the following: the high-speed blue ground coat; titanium-base, cover-coat enamels; one-fire enamels—white on steel at normal and at low temperatures; ground coats and cover coats (one and two-fire)—at low and at high temperatures. (Presented at 15th Annual Convention of Institute of Cooking and Heating Appliance Manufacturers.)

7b-25. Various Applications of Metalizing Technique in Refinery Operations. Howard Batsford. *Petroleum Refiner*, v. 27, Feb. 1948, p. 101-104.

Notes on techniques and specific applications.

7b-26. The Protection of Steel by Various Nonmetallic Coatings. J. C. Hudson and T. A. Banfield. *Journal of the Iron and Steel Institute*, v. 158, Jan. 1948, p. 99-110.

An interim report on the behavior of a range of protective nonmetallic coatings applied to structural mild steel and exposed to field corrosion tests. Part of the investigations conducted by the Protective Coatings Sub-Committee of the British Iron and Steel Research Association. The tests cover periods of up to 5 years. Includes results of sea-water immersion testing.

7b-27. How to Prevent Defects in Porcelain Enameling Holloware. F. A. Peterson. *Ceramic Industry*, v. 52, Feb. 1948, p. 50-51.

First installment of series devoted to kitchenware discusses scumming. (To be continued.)

7b-28. Protecting Ferrous Metals From Corrosion. *Machinery* (London), v. 72, Jan. 22. 1948, p. 121

Pickling and priming methods used by General Electric Co., Ltd., for the treatment of cast and fabricated ferrous components.

7b-29. Fabricating and Finishing Stainless Steel—Part II. Arthur P. Schulze. *Metal Finishing*, v. 46, Feb. 1948, p. 59-64.

Surface treatments for stainless steel: scale removal by sandblasting, pickling, molten and aqueous alkali solutions, and passivating. Formulas and methods used in the most modern processes. 10 ref.

7b-30. Production and Application of Paints for Machine Parts. A. Kufferath. *Paint and Varnish Production Manager*, v. 28, Feb. 1948, p. 38, 40-44.

Recommended formulations and procedures for iron and steel parts.

7c—Nonferrous-Base Metals

7c-7. Application of Organic Finishes to Zinc Alloys. R. Mansell. *Modern Industrial Press*, v. 10, Jan. 1948, p. 6, 8.

Recommended procedures.

7c-8. Production Clinic for Finishing Die Castings. *Die Castings*, v. 6, Feb. 1948, p. 57-59.

Cleaners for zinc die castings and preparing aluminum for organic finishes. 14 ref.

7c-9. Synthetic Enamels for Insulation of Copper Wire. (Concluded.) C. R. Pye. *Plastics* (London), v. 12, Jan. 1948, p. 21-24.

Second and concluding installment of review contains 31 additional references.

7d—Lightweight-Base Metals

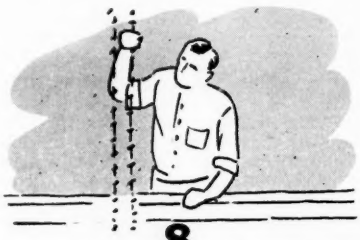
7d-5. Twin Coach Develops Special Methods for Painting Aluminum Buses. Walter Rudolph. *Automotive Industries*, v. 98, Feb. 1, 1948, p. 40-41, 66.

7d-6. Protective and Decorative Finishes for Aluminum. Ray Swan and N. P. Ruther. *Products Finishing*, v. 12, Feb. 1948, p. 32, 34, 36, 38, 40.

General recommendations for surface preparation and application of finishes, and their selection.

For additional annotations indexed in other sections, see:

6b-14-16; 8-32; 11-29-30; 13-9; 14c-11; 15a-2; 15b-5; 16b-12; 21a-30; 24b-16; 27b-8-9



8

ELECTRODEPOSITION and ELECTROFINISHING

8-13. Some Technical Applications of the Electrolytic Polishing of Metals. R. E. Halut. *Sheet Metal Industries*, v. 25, Jan. 1948, p. 113-121, 124.

A review. 36 ref.

8-14. A New Surface Treatment for Magnesium. A. L. Kohl and Herbert Waterman. *Iron Age*, v. 161, Jan. 22, 1948, p. 50-55.

Treatment consists of anodizing the parts in a hot, saturated, sodium carbonate solution. The treatment forms a white crystalline coating which is an electrical insulator and very resistant to abrasion. Tests indicate the value of the coating for corrosion resistance and also as a paint base. 10 ref.

8-15. Recent Developments in the Finishing of Zinc-Base Alloy Die Castings. Maurice R. Caldwell. *Plating*, v. 35, Feb. 1948, p. 135-140.

Results of experimental work and outdoor exposure tests on automobile hardware at Doehler-Jarvis Corp. Effects of variations in plating baths, thickness of plate, polishing and buffing procedures, are shown by photographs and photomicrographs.

8-16. Plating of Zinc-Base Alloy Die Castings. R. M. Wagner. *Plating*, v. 35, Feb. 1948, p. 141-144.

Plating of die castings for exterior automotive use. Based upon the methods and processes in use by the Guide Lamp Division of General Motors Corp. Generalizations regarding requirements for adequate protection are supported by the comments of several outstanding plating experts. Adhesion, protective properties, and appearance.

8-17. Causes of Failure of Plated Coatings in Automotive Service. E. A. Anderson and C. E. Reinhard. *Plating*, v. 35, Feb. 1948, p. 145-152.

Results of a thorough investigation of 71 plated zinc alloy die-cast parts, mostly from 1941 model cars with 5 years' service, from different locations, in order to permit comparisons among different atmospheric environments.

8-18. Electrodeposition of Tungsten Alloys. *Technical News Bulletin* (National Bureau of Standards), v. 32, Jan. 1948, p. 4-5.

Abstracted from "Electrodeposition of Tungsten Alloys Containing Iron, Nickel, and Cobalt," by Abner Brenner, Polly Burkhead, and Emma Seegmiller, *Journal of Research of the National Bureau of Standards*, v. 39, 1947, p. 351. See 8-172, R.M.L. v. 4, 1947 (*Metals Review*, Jan. 1948).

8-19. Zinc Alloy Die Castings—Quality, Design and Plating Procedures. L. A. J. Lodder. *Journal of the Electrodepositors' Technical Society*, v. 22, 1947, p. 199-205. (Reprint).

Zinc alloy die castings from the point of view of the electroplater. Procedure for copper plating is equally applicable whether bright or dull nickel is to follow the primary deposit of copper.

8-20. The Electrolytic Polishing of Metals. G. Tolley. *Metallurgia*, v. 37, Dec. 1947, p. 71-74.

A review. 42 ref.

8-21. Solution Purification; Continuous Low Current Density Electrolytic Unit. C. E. Heussner and L. M. Morse. *Metal Industry*, v. 72, Jan. 2, 1948, p. 6-8, 13.

Previously abstracted from "Continuous Electrolytic Solution Purification", *Monthly Review*, v. 34, Nov. 1947, p. 1243-1249. See 8-163, R.M.L., v. 4, 1947 (*Metals Review*, Dec. 1947).

8-22. Dépot Electrolytique de ThB et ThC sur Divers Métaux. (Electrodeposition of ThB and ThC on Various Metals.) André Coche. *Comptes Rendus* (France), v. 225, Nov. 17, 1947, p. 936-939.

The variation of critical potential with the nature of the support was studied for the electrodeposition of ThB on Au, Ag, Cu, Pt, and Ta; and of ThC on Au, Pt, and Ta.

8-23. Plating Chromium by Thermal Decomposition of Chromium Hexacarbonyl. B. B. Owen and R. T. Webber. *Metals Technology*, v. 15, Jan. 1948, T.P. 2306, 5 pages.

Results of preliminary experiments upon the plating of chromium from its carbonyl. Apparatus and technique used. 36 plating runs were made using mild-steel disks.

8-24. The Influence of Internal Stress on the Structure of Electrodeposits. M. R. J. Wyllie. *Journal of Chemical Physics*, v. 16, Jan. 1948, p. 52-64.

Properties of chromium electrodeposited from a standard chromic-acid electrolyte. It is shown that the data agree with the assumption that the preferred orientation found is the result of a slipping process, analogous to cold working, which occurs during deposition when internal contractile stress reaches a certain critical value. The type of orientation found also agrees with the theory. It is believed that (111) orientation is to be expected generally for body-centered cubic metals electrodeposited in a state of contractile stress, while (110) or (100) is to be anticipated for the face-centered type deposited with the same type of stress. The orientations of a number of electrodeposited metals are shown to agree with this hypothesis. Certain anomalies in the stress and orientation results for Ag, Ni, and Al deposits were studied experimentally, and the results explained on the basis of the above theory. The possible mechanism of internal-stress formation in electrodeposits. 37 ref.

8-25. Rhodium Plating and Its Application to Reflectors. A. H. Stuart. *Electroplating*, v. 1, Jan. 1948, p. 88-90, 102.

Phenomenon of reflectivity and results of some laboratory tests on

(Turn to page 24)

a true solution rather than an emulsion. It has low interfacial tension and does not evaporate nor become rancid. (Literature available.) **Anderson Oil Co. Inc. (318)**

A triple-acting cutting fluid combines lubrication, cooling and cleaning. It is a liquid concentrate, noninflammable and nontoxic. It is diluted with approximately 15 parts of water. An emulsifier, it eliminates an additional cleaning step. **Penetone Co. (319)**

High active sulphur content with absence of disagreeable odor is a new development incorporated in Gulf's Lasupar cutting oil, Electro cutting oil and L.S. cutting base. **Gulf Oil Corp. (320)**

Silver-Chip No. 2 is a precision grinding compound that is universally applicable to copper, aluminum, brass, steel and cast iron. (Literature available.) **Machinery Lubricants, Inc. (321)**

A recently revised edition of the booklet "Cutting Fluids for Better Machining" is a 72-page catalog of metalworking information; it includes useful sections on the metal cutting mechanism, selection of cutting fluids and rules for prolonging tool life. **D. A. Stuart Oil Co., Ltd. (323)**

"Metal Cutting Fluids" is a 26-page treatise on the action of cutting fluids, their composition and application. Cutting fluid recommendation charts and machinability rating chart are included. **Cities Service Oil Co. (324)**

A new type of lubricant for press forging of brass is a dispersion of semicolloidal graphite supplied in concentrated form that is added to another fluid on use. The lubricant insures free flow of the metal to all parts of the die, and forming of intricate shapes in perfect detail. **Acheson Colloids Corp. (325)**

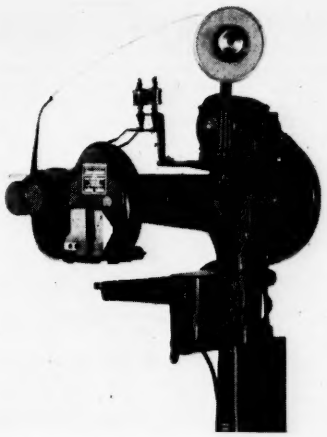
A heavy-duty compound for drawing steel, designed primarily for use without dilution, is identified as Super-Draw M-106, although it may be thinned with water if necessary. It need not be cleaned off before welding and has anticorrosive qualities. **Northwest Chemical Co. (326)**

Miscellaneous Equipment

A "cool grinding" unit injects coolant directly to the work being ground. It consists of a reservoir mounted on the spindle column, a sight drip valve and a special wheel adapter. From the wheel adapter the coolant enters the arbor hole of the grinding wheel and is thown by centrifugal force to the outside grinding face. **DoAll Co. (327)**

A sump cleaner for removing chips, grindings, cutting oil or soluble coolant from machine tool sumps transfers oil or coolant from sump to tank by vacuum so that no contaminated liquids pass through the pump. A three-way valve instantly changes suction to pressure, so that it may be used for dispensing clean as well as removing dirty liquids. **Honan-Crane Corp. (328)**

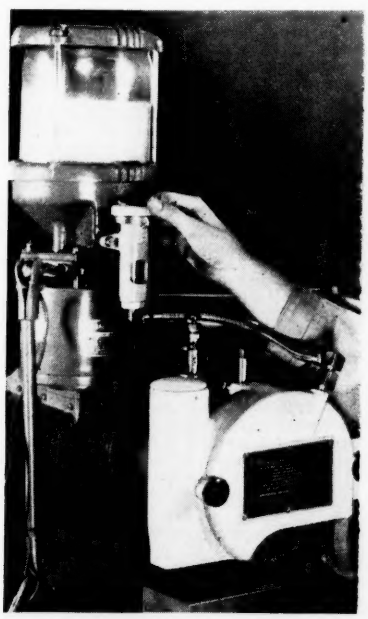
A coolant temperature control unit for use with New Britain-Gridley automatic screw machines maintains the coolant within 2 or 3° of a predetermined point whether the machine is running at high speed, stopped, or idle overnight. Cooling is by evaporation of moisture and heating by an electric element. **Niagara Blower Co. (329)**



Acme-Morrison Metal Stitcher

Acme-Morrison metal stitchers replace riveting and spot welding in the fabrication of light metals. No prepunching or cleaning is necessary. Wire from a continuous coil punches out a clean slug as the stitch is driven. The machine will join metal to metal or to nonmetallic materials. **Acme Steel Co. (330)**

An electric impact tool weighing only 6½ lb. will drill steel, wire-brush, apply and remove studs, tap, ream, drive and remove screws. Plugged into an electric socket, it runs as any conventional electric tool until the going gets tough, when the impact mechanism functions to deliver 1900 rotary impacts to the job. (Literature available.) **Ingersoll-Rand Co. (331)**



DoAll Cool Grinding Unit

READER SERVICE COUPON

Check These Numbers for Production Information and Manufacturers' Catalogs. The following numbers refer to the new products and bulletins listed in the preceding article on "Presses and Tools" starting on page 9.

THIS COUPON IS VOID AFTER JUNE 1, 1948

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the effect of exposure on the reflectivity of polished metal surfaces. Rhodium electroplating procedure.

8-26. Laboratory Test and Equipment. J. B. Mohler and H. J. Sedusky. *Metal Finishing,* v. 46, Feb. 1948, p. 50-55.

Methods of testing and the equipment used by the electroplater. (To be continued.)

8-27. Anodic Reactions of Aluminum and Its Alloys in Sulphuric and Oxalic Acid Electrolytes. Ralph B. Mason and Charles J. Slunder. *Metal Finishing,* v. 46, Feb. 1948, p. 65-70.

Previously abstracted from *Industrial and Engineering Chemistry.* See item 8-177, R.M.L., v. 4, 1947.

8-28. Electropolishing—a Survey. Samuel Wein. *Metal Finishing,* v. 46, Feb. 1948, p. 71-77.

Recipes for make-up of a large number of electropolishing baths, as obtained from the literature. 57 ref.

8-29. Nickel Plating. *Metal Finishing.* v. 46, Feb. 1948, p. 83.

A tabulation of information useful in designating metallic surface treatments.

8-30. Process Sheet for Cadmium Plating. George Black. *American Machinist,* v. 92, Feb. 12, 1948, p. 145.

A flow chart.

8-31. Physical Properties of Electrodeposited Chromium. Abner Brenner, Polly Burkhead, and Charles Jennings. *Journal of Research of the National Bureau of Standards,* v. 40, Jan. 1948, p. 31-59.

The following properties of chromium, deposited under a wide variety of plating conditions, were measured: density, hardness, tensile strength, Young's modulus of elasticity, ductility, electrical resistivity, and stress in the deposit. The oxygen and hydrogen content were also determined, as well as effects of heat treaments up to 1200° C. on certain of these properties. Some work was done on the properties of Cr-Fe alloys deposited from modified chromic acid solutions. A relation between the hydrogen and oxygen content of the deposits was shown to exist, and the effect of the oxygen content on the physical properties was studied. 40 ref.

8-32. Plating Zinc Die-Castings; Pretreatment Prior to Bright Nickel Deposition. P. Berger. *Metal Industry,* v. 72, Jan. 30, 1948, p. 88-90.

Methods for preliminary treatment, an operational sequence suitable for rapid production plating, and methods for the prevention of undesirable phenomena, such as overcleaning. The inter-activity of zinc as a base metal for electrodeposited undercoatings such as copper and brass. (To be concluded.) (Presented at meeting of Electrodepositors' Technical Society.)

8-33. Concerning Dense and Porous Cathodic Deposits of Cadmium and Manganese. (In Russian.) O. Kudra and E. Gitman. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 20, July 1947, p. 605-612.

Decomposition voltages of Cd and Mn salt solutions were investigated using a modified method. Two decomposition potentials were obtained in cadmium salt solutions—the lower one corresponding to solid cadmium and the higher one, at an increased cathode current density, to porous deposits. Three decomposition potentials were obtained in Mn salt solution: the lower one corresponds to evolution of hydrogen, the intermediate one, to deposition of dense Mn, and the higher one to formation of porous deposits. Results prove that the formation of porous cathode deposits should be ascribed neither to the action of hydrogen nor to the formation of crystallization centers and the growth of single crystals, but is caused by the discharge of complex cations.

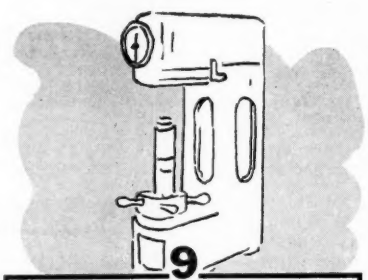
8-34. Carbonate Anodizing of Aluminum Alloys. II. Anodization of Duralumin With Direct Current Over A Range of Concentrations and Temperatures. (In Russian.) A. F. Bogoyavlenskii. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 20, July 1947, p. 613-619.

Results of a study to determine conditions for production of a film with maximum corrosion resistance. The method is applicable to commercial practice, since the quality of the oxide film is not inferior to that of the sulphate method.

8-35. Variation of Resistance of Electrolytes With Form Size, and Arrangement of Electrodes. III. Combination of Flat and Cylindrical Electrodes. (In Russian.) V. P. Mashovets, V. V. Cherdyntsev, and M. V. Neustrueva. *Zhurnal Prikladnoi Khimii,* (Journal *of Applied Chemistry),* v. 20, July 1947, p. 660-669.

An equation is derived for the dependence of electrolyte resistance on interpolar distance. Experimental measurements show that the equation is sufficiently accurate for technical purposes for small interpolar distances. For large distances, an empirical correction requiring determination of resistance for any one distance is necessary.

For additional annotations indexed in other sections, see:
4a-9; 7a-43-45; 10a-10-16-17; 27a-26; 27c-5.



9 PHYSICAL and MECHANICAL TESTING

9a—General

9a-10. A New Hardness Tester of the Poldi Steel Works. V. Jares. *Engineers Digest* (American Edition), v. 4, Dec. 1947, p. 582. Translated and condensed from *Strojnicky Obzor,* v. 27, 1947, p. 213-214.

Tester is based on the Vickers principle, but is characterized by its simplicity without sacrifice of accuraoy. Its weight is only about 14 lb., and the load is applied through a helical spring which is accurately calibrated and preloaded by a hand lever.

9a-11. How to Construct a Stress-Strain Diagram by Hardness Measurements. N. N. Davidenkov. *Metallurgia,* v. 37, Dec. 1947, p. 102-104. Translated from *Zhurnal Technicheskoi Fiziki* (Journal of Technical Physics), v. 13, no. 7-8, 1945, p. 389.

Basic principles of a method utilizing the usual Brinell hardness tests without making an actual tensile test.

9a-12. Metallic Abrasives; Methods of Testing and Evaluation. J. E. Hurst. *Iron and Steel,* v. 21, Jan. 1948, p. 18-22.

9a-13. Rupture Testing in a 48-Bar Furnace. J. D. Nisbet. *Iron Age,* v. 161, Feb. 12, 1948, p. 81-82.

The largest rupture-testing furnace ever built, including some of the unusual construction features that make this unit flexible and accurate.

9a-14. Methods of Testing Metallic Abrasives. J. E. Hurst. *Foundry Trade Journal,* v. 84, Jan. 22, 1948, p. 73-80; discussion, p. 80.

(Presented at annual meeting of Institute of Vitreous Enamellers.)

9a-15. 150-Ton Structure-Testing Machine. *Engineering,* v. 165, Jan. 23, 1948, p. 79-82, 84.

New British machine.

9a-16. Investigation of the Elongation Diagram and Determination of the Yield Point by Means of a Magnetic Method. (In Russian.) M. V. Dekhtyar. *Zhurnal Teknicheskoi Fiziki* (Journal of Technical Physics), v. 17, Oct. 1947, p. 1111-1118.

Method for investigating the elongation of ferromagnetic materials on the basis of the sign of the increment of magnetic susceptibility. This method makes it possible to determine stresses corresponding to the beginning of plastic deformation of individual grains (the limit of elasticity) and also the yield point.

9a-17. A Method for Hardness Testing of Very Small Structural Parts. (In Russian.) A. D. Kuritsyna, E. S. Berkovich, and M. M. Khrushchov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 13, Oct. 1947, p. 1227-1233.

Use of a Russian microhardness testing apparatus for items such as parts of watches or precision instruments. Hardness numbers are obtained in Vickers or Brinell units.

9a-18. Determination of Impact Strength of Thin Sheet Material. (In Russian.) Ya. S. Yakovleva and M. V. Yakutovich. *Zavodskaya Laboratoriya,* (Factory Laboratory), v. 13, Oct. 1947, p. 1263-1266.

Test specimens, apparatus, and procedure.

9a-19. A Method for Mechanical Testing at Low Temperatures. (In Russian.) E. M. Shevandin. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 13, Oct. 1947, p. 1268-1269; also Brutcher Translation No. 2047 under title, **Precautions to Be Taken in Tests for Mechanical Properties at Subzero Temperatures,** 4 pages, Henry Brutcher, Altadena, Calif.

Precautions to be observed during use of liquid air to obtain the desired temperatures, including use of suitable insulating materials.

9b—Ferrous

9b-2. Some Notes on Tensile Testing. Frank W. Sowa. *Iron Age,* v. 161, Jan. 22, 1948, p. 68-69.

The manner in which workhardening of steel takes place, and the effect of rate of loading on test data, were investigated. Notch effects compared with results obtained on unnotched specimens.

9b-3. Spin Disks in "Whirl Pit" to Test Steel and Welds. *Welding Journal,* v. 27, Jan. 1948, p. 93-94.

Application in a research program now going on at M.I.T. sponsored by the Welding Research Council of the Engineering Foundation.

9b-4. Notch Toughness of Steel Plates. D. F. Windenburg. *Product Engineering,* v. 19, Feb. 1948, p. 110-113.

Work being done under Navy sponsorship on measurement of notch toughness of steel plates for the purpose of determining the causes of failure in welded mer-

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Metallurgical Books

By Sibyl E. Warren

Lingren Library, Mass. Inst. of Technology

A Bibliography, Classified by Subject Matter, of Metallurgical and Near-Metallurgical Books Published in the Years 1936-1946

THIS BIBLIOGRAPHY, compiled for the period 1936 through 1946, covers metallurgical books and in some instances near-metallurgical books which are frequently used in metallurgy. One of the most recent surveys concerned with metallurgical books was compiled by Richard Rimbach under the title, "How to Find Metallurgical Information". It carried a list of metallurgical books in print on Aug. 1, 1936.

This present compilation, which includes similar books since 1936, was intended originally for use of the metallurgy department of the Massachusetts Institute of Technology. The broad interest occasioned by this summary indicated that publication was warranted.

The bibliography is neither selective nor annotated since it was felt that selection at best is an impossible task. It is a means, however, of checking quickly the publications of interest in the various branches of metallurgy.

The outline of the classification scheme is shown below. The bibliography will be published in 11 monthly installments. This issue lists 14 books that can only be classified under "Metallurgy in General", and also contains Section I-A on Process Metallurgy. Succeeding sections will be published in order in subsequent issues.

* * *

Classification Scheme

I. Metallurgy (in General)

(A) Process Metallurgy

1. Ore Dressing
2. Pyrometallurgy, Hydrometallurgy, Electrometallurgy
3. Furnaces, Refractories, Fuels, Slags, Temperature, Pyrometry

(B) Physical Metallurgy

1. Structure and Properties of Metals and Alloys
   (a) Phase Relations
2. Metallography
   (a) Microscope, Polishing, Etching
   (b) X-Ray Analysis, Radiography
3. Heat Treating
4. Testing and Mechanical Properties
5. Corrosion and Oxidation

(C) Mechanical Metallurgy

1. Powder Metallurgy
2. Casting
   (a) Patterns, Molds, Foundry Sands
3. Welding and Cutting
   (a) Electric
   (b) Gas
   (c) Soldering
4. Other Processes: Forging, Rolling, Extrusion, Drawing, Stamping, Spinning, Machining
5. Surface Treatment
   (a) Plating, Galvanizing
   (b) Enameling, Coloring, Spraying
   (c) Others

II. Metals (in General)

(a) Analysis

(A) Ferrous

(a) Biography, Economics, History

1. Iron
   (a) Cast
   (b) Iron and its Alloys
2. Steel
   (a) Special Steels

(B) Nonferrous

1. Aluminum, Magnesium.
2. Brass, Bronze, and Bearing Metals
3. Copper
4. Gold, Silver, Platinum, and Other Precious Metals
5. Other Nonferrous Metals and Alloys

I. Metallurgy (in General)

Biringuccio, Vannoccio. **The Pirotechnia of Vannoccio Biringuccio, translated from the Italian with an Introduction and Notes, by Cyril Stanley Smith and Martha Teach Gnudi. American Institute of Mining and Metallurgical Engineers, New York, N. Y., 1942, 476 p.**

Butts, Allison. **Metallurgical Problems.** Ed. 2. McGraw-Hill Book Co., Inc., New York, N. Y., 1943, 446 p.

Carpenter, (Sir) H. C. H. and Robertson, J. M. **Metals.** Oxford University Press, London, 1939, 2 v.

Clapp, W. H. and Clark, D. S. **Engineering Materials and Processes: Metals and Plastics.** International Textbook Co., Scranton, Pa., 1938, 543 p.

Frier, W. T. **Elementary Metallurgy.** McGraw-Hill Book Co., Inc., New York, N. Y., 1942, 207 p.

Henry Ford Trade School. **Metallurgy and Metallography.** School, Dearborn, Mich., 1942.

Houghton, E. F., and Co. **Practical Metallurgy for Engineers.** Ed. 4. rev. Company, Philadelphia, Pa., 1943, 479 p.

Johnson, Frederick. **Metallurgical Experiments (Nonferrous Metals, Iron and Steel).** Paul Elek, Ltd., London, 1944, 78 p.

Leighou, R. B. **Chemistry of Engineering Materials.** Ed. 4. McGraw-Hill Book Co., Inc., New York., 1942 645 p.

McMullan, O. W. and Talbot, A. M. **Metallurgy. Metallurgy of Iron. Metallurgy of Steel. Metallurgy of Nonferrous Metals.** International Textbook Co., Scranton, Pa. 1936-1940, Parts 1-3.

Newton, Joseph. **An Introduction to Metallurgy.** John Wiley & Sons, Inc., New York, N. Y., 1938, 537 p.

Singer, T. E. R. **German-English Dictionary of Metallurgy.** McGraw-Hill Book Co., Inc., New York, N. Y., 1945, 298 p.

Stoughton, Bradley and Butts, Allison. **Engineering Metallurgy.** Ed. 3. McGraw-Hill Book Co., Inc., New York, N. Y., 1938, 525 p.

White, A. H. **Engineering Materials.** McGraw-Hill Book Co., Inc., New York, N. Y., 1939, 547 p.

A. Process Metallurgy

(In General)

Hayward, C. R. **An Outline of Metallurgical Practice.** Ed. 2. D. Van Nostrand Co., New York, N. Y., 1940, 690 p.

Peele, Robert, and Church, J. A., editors. **Mining Engineers' Handbook.** Ed. 3. John Wiley & Sons, Inc., New York, N. Y., 1941, 2 v.

Rostovtsev, C. T. **Teoriia metallurgicheskikh protsessov.** Moskva Gosudarst. nauch.-tekhn. isdat., 1944, 307 p.

U. S. Bureau of Mines, Metallurgical Division. **Conference on Metallurgical Research, Held at Salt Lake City, Utah, May 21, 1940.** Bureau, Washington, D. C., 1940, 156 p.

Wenner, R. R., **Thermochemical Calculations.** McGraw-Hill Book Co., Inc., New York, N. Y., 1941, 384 p.

1. Ore Dressing

Bugbee, E. E. **A Textbook of Fire Assaying.** Ed. 3. John Wiley & Sons, Inc., New York, N. Y., 1940, 314 p.

Dean, R. S. and Davis, C. W. **Magnetic Separation of Ores.** Government Printing Office, Washington, D. C., 1941, 417 p.

Gaudin, A. M. **Principles of Mineral Dressing.** McGraw-Hill Book Co., Inc., New York, N. Y., 1939, 554 p.

Havre, Horace. **La concentration des minerais par flottation.** C. Beranger, Paris, 1938, 460 p.

Low, A. H., Weinig, A. J. and Schoder, W. P. **Technical Methods of Ore Analysis.** Ed. 11. John Wiley & Sons, Inc., New York, N. Y., 1939, 325 p.

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chant ships and means of eliminating or minimizing it. Details of the test specimen developed to show the transition from ductile to brittle fracture in plate specimens of appreciable size. Typical test results are charted, discussed, and compared with Charpy test results, showing wide variance. Need for much more work to develop entirely satisfactory test procedures.

9b-5. Ferromagnetic Metals; Identification and Measurement of Internal Stresses. Part I—Magnetic Tests. Albert Borowik. *Iron and Steel,* v. 21, Jan. 1948, p. 3-6.

Results of experimental investigation. (To be continued.)

9b-6. Impact Testing of Steels and Alloys at High Temperatures. (In Russian.) A. B. Al'tman and G. V. Estulin. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 13, Oct. 1947, p. 1218-1221.

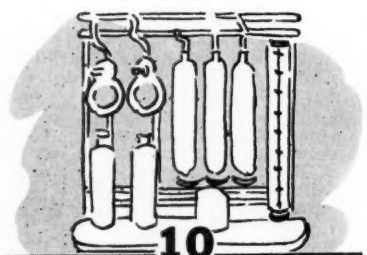
A specially designed furnace and testing apparatus. Results of testing of carbon steel, with and without 0.1% Pb, from 800 to 1200° C., and of 18-8 stainless steels containing Ti, and also W, at 20, 600 and 700° C.

9b-7. Notch Effect in Cold Brittleness of Steel. II. Method of Determination of Cold Brittleness of Notched Pieces. (In Russian) E. M. Shevandin. *Zhurnal Teknicheskoi Fiziki* (Journal of Technical Physics), v. 17, Oct. 1947, p. 1119-1136.

The influence of notch shape on the critical temperature of brittleness of soft iron at different rates of stress application was investigated. On the basis of the data obtained, a diagram showing the dependence of cold brittleness on rate of deformation, test temperature, and notch-shape factors, is presented. 10 ref.

For additional annotations indexed in other sections, see:

3a-10; 3b-15-16-25-28-30; 3d-8; 8-26; 18d-1; 24a-31.



10 ANALYSIS

10a—General

10a-10. A.E.S. Research Project No. 2; Determination of Impurities in Electroplating Solutions. VII. Traces of Silica in Nickel-Plating Baths. Earl J. Serfass, W. S. Levine, and P. J. Prang. *Plating,* v. 35, Feb. 1948, p. 156-160, 196.

No references were found in the literature to methods for the above analysis, specifically. However, there are hundreds of reports of silica determination in other materials. Based on these, a precise gravimetric and an approximate colorimetric method were developed. 27 ref.

10a-11. Titration of Iron in High-Temperature Alloys. Louis Silverman. *Steel,* v. 122, Jan. 26, 1948, p. 66, 68.

Details of copper-powder reduction method for determination of iron in the presence of such elements as Ni, Co, Cr, W, Si, Mn, and Al.

10a-12. Some Applications of Inorganic Chromatography. (Concluded). G. Robinson. *Metallurgia,* v. 37, Dec. 1947, p. 107-108.

Miscellaneous reagents; two-dimensional methods; inorganic partition chromatography. 10 ref.

10a-13. Simple Field Test for Distinguishing Minerals by Abrasion pH. Rollin E. Stevens and Maxwell K. Carron. *American Mineralogist,* v. 33, Jan.-Feb. 1948, p. 31-49.

Simple test using the pH of suspensions made by grinding in water. The term abrasion pH is proposed to designate pH values obtained by this technique, which may differ from pH values obtained by shaking previously ground minerals in water. Abrasion pH values are given for about 280 mineral species, many of them confirmed repeatedly by determinations on specimens from different localities.

10a-14. Zinc Determination; Absorptiometric Methods in Bright-Nickel Plating Solutions. D. F. Phillips and L. J. Holton. *Metal Industry,* v. 72, Jan. 23, 1948, p. 69-70.

Development of a rapid and precise method for determining amounts of zinc from 0 to 200 pieces per minute.

10a-15. Electrometric Noncompensating Method for Determination of Nickel and Copper in Ores. (In Russian.) S. K. Chirkov. *Zavodskaya Laboratoriya* (Factory Laboratory), Oct. 1947, p. 1158-1162.

Ni and Cu are titrated successively using a KCN solution in ammonia in the presence of NH_4Cl using the electrode pair Pt-Ag. Includes titration curves.

10a-16. Polarographic Method for Control of Electrolytic Bath Compositions. III. (In Russian.) D. A. Vyakhirev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 13, Oct. 1947, p. 1167-1171.

Use of stationary Pb electrodes instead of Hg for the amperometric titration of sulphate solutions, especially nickel-plating baths. 11 ref.

10a-17. Use of Polarographic Method in Analysis of Zinc-Plating Baths. (In Russian). I. A. Korshunov and L. N. Sazanova. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 13, Oct. 1947, p. 1172-1173.

The polarographic techniques for determination of Zn, Al, Cu, Fe, Pb, and other substances which are present is described and results are compared with those obtained gravimetrically.

10a-18. Alternating-Current Arc With Electron Tube Control for Spectrographic Analysis. (In Russian). N. F. Vollerner. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 13, Oct. 1947, p. 1215-1217.

Circuit details. The installation results in greater arc stability and greater ease of adjustment.

10a-19. Rapid Method for Determination of Calcium in Slags. (In Russian.) P. Ya. Yakovlev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 13, Oct. 1947, p. 1253.

Method described is based on precipitation of Ca in the form of oxalate in NH_3 medium, followed by volumetric determination of the unreacted oxalic acid.

10a-20. Rapid Method for Determination of Manganese in Ores. (In Russian). N. S. Tkachenko and S. M. Khripach. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 13, Oct. 1947, p. 1254-1255.

Method based on back titration of excess $KMnO_4$ by bivalent Mn.

10a-21. Rapid Determination of Copper in a Nickel Electrolyte. (In Russian.) V. V. Drozdov, E. S. Kozich, and A. L. Rotinyan. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 13, Oct. 1947, p. 1256.

Compares volumetric methods—one direct and other indirect.

10b—Ferrous-base Metals

10b-6. The Determination of Columbium in Rustless and Heat Resisting Steels. Part I. B. Bagshawe and W. T. Elwell. **Part II. A Cooperative Examination of Some of the Methods Available.** S. W. Craven. *Journal of the Society of Chemical Industry,* v. 66, Nov. 1947, p. 398-402.

In Part I a procedure is described for the above determination in high-chromium, nickel steel. Provision is made for the presence of W, Ti, and Mo. By a slight adjustment of conditions, tungsten precipitation is quantitative and a simultaneous determination may be made. The efficiency of hydrolysis separations is discussed and a method of sulfurous acid hydrolysis from divalent iron solution is recommended. In Part II, results are given of a cooperative examination of several methods by six laboratories. Various features of the methods are discussed and the order of agreement obtained by different laboratories working independently is shown.

10b-7. Spark Technique in Spectrographic Analysis of Slags. Ralph H. Steinberg and Henry J. Belic. *Analytical Chemistry,* v. 20, Jan. 1948, p. 72-73.

A method for determining lime-silica ratio, of sufficient accuracy for openhearth control.

10b-8. Improved Combustion Technique Speeds Carbon Analysis of Steel. *Steel,* v. 122, Feb. 16, 1948, p. 96.

Time required is reduced from 10 to 8 min. by technique carried out at 1100° C.—about 60° C. higher than the former procedure. Involves simplified preparation of samples with resulting improvement in accuracy.

10b-9. Hydrogen, Nitrogen and Oxygen in Ferrous Metals. Their Properties and Their Determination—Part III. E. C. Pigott. *Metallurgia,* v. 37, Jan. 1948, p. 129-132.

Procedures for determining nitrogen contents.

10b-10. Les Methodes Récentes de Dosage de l'Oxygene, de l'Hydrogene et de l'Azote dans le Fer et les Aciers et Leurs Principales Applications. (Recent Methods for Analysis of Oxygen, Hydrogen, and Nitrogen in Iron and Steels and Their Principal Applications). Georges Chaudron. *Revue de Métallurgie,* v. 44, May-June 1947, p. 144-154; discussion, p. 155

Several recently devised methods and the various types of apparatus for oxygen determination. 31 ref.

10b-11. Dosage du Manganese dans les Aciers Faibles Teneurs (0.100 a 0.010%). (Determination of Manganese in Steels; Low Contents (0.100 to 0.010%). Paul Rocquet. *Revue de Metallurgie,* v. 44, May-June 1947, p. 156-160.

Lingane's method of determining small percentages of Mn in steel is described. This method applies only to a few general types of steels. The colorimetric method, using oxidation by periodate, is preferred to titrimetric methods using persulphate, since the latter give variable results.

10b-12. Le Dosage de l'Oxygene dans les Aciers par Diffusion de l'Aluminum. (Determination of Oxygen in Steels by Diffusion of Aluminum). Jean Massinon. *Revue de Métallurgie,* v. 44, May-June 1947, p. 174-179.

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Rabone, Philip. **Flotation Plant Practice. Ed. 3, rev.** Mining Publications, Ltd., London, 1939, 184 p.

Remington, J. S. and Jameson, F. L. **Metallurgical Analysis and Assaying.** Technical Press, Ltd., London, 1939, 101 p.

Richards, R. H., Locke, C. E. and Schuhmann, R. **Textbook of Ore Dressing.** Ed. 3, completely revised and rewritten. McGraw-Hill Book Co., Inc., New York, N. Y., 1940, 608 p.

Schoeller, W. R. and Powell, A. R. **The Analysis of Minerals and Ores of the Rarer Elements.** Ed. 2. entirely rewritten. Charles Griffin and Co., Ltd., London, 1941, 303 p.

Shepard, O. C. and Dietrich, W. F. **Fire Assaying.** McGraw-Hill Book Co., Inc., New York N. Y., 1940, 277 p.

Taggart, A. F. **Handbook of Mineral Dressing. v. 1. Ores and Industrial Minerals.** John Wiley & Sons, Inc., New York, N. Y., 1945, 1915 p.

Wark, I. W. **Principles of Flotation.** Australasian Institute of Mining & Metallurgy, Melbourne, 1938, 346 p.

2. Pyrometallurgy, Hydrometallurgy, Electrometallurgy

Baimakov, Yu. V. **Electrolysis in Metallurgy. v. 1. Electrolysis in Aqueous Solutions.** (In Russian) Metallurgizdat, Moscow, 1939, 470 p.

Creighton, H. J. M. and Kohler, W. A. **Principles and Applications of Electrochemistry.** Ed. 4. John Wiley & Sons, Inc., New York, N. Y., 1943, v. 1., 477 p.

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Dorr, J. V. **Cyanidation and Concentration of Gold and Silver Ores.** McGraw-Hill Book Co., Inc., New York, N. Y., 1936, 485 p.

Levasseur, Albert. **L'électrochimie et l'électrometallurgie.** Ed. 4. Dunod, Paris, 1939, 2 v.

Mainardis, Mario. **I forni elettrici e le industrie elettrosiderurgiche. elettrometallurgiche, elettrochimiche, elettrotermiche, elettrolitiche.** Ed. 2. U. Hoepli, Milan, 1943, 617 p.

Mantell, C. L. **Industrial Electrochemistry.** Ed. 2. McGraw-Hill Book Co., Inc., New York, N. Y., 1940, 656 p.

3. Furnaces, Refractories, Fuels, Slags, Temperature, Pyrometry

American Chemical Society, Division of Gas and Fuel Chemistry. **Symposium on Furnace Atmospheres for Metallurgical Purposes.** Society, Washington, D. C., 1940.

American Institute of Physics. **Temperature, Its Measurement and Control in Science and Industry.** (Symposium) Reinhold Publishing Corp., New York., N. Y., 1941. 1362 p.

American Society for Metals. **Induction Heating.** Society, Cleveland, Ohio, 1946, 172 p.

American Society for Testing Materials. **Manual of A.S.T.M. Standards on Refractory Materials.** Society, Philadelphia, Pa., 1941, 174 p.

Carr, A. R. and Selheimer, C. W. **Fuels and Their Utilization.** Pitman Publishing Corp., New York, N. Y., 1940, 180 p.

Carslaw, H. S. **Introduction to the Mathematical Theory of the Conduction of Heat in Solids.** Ed. 2. Dover Publications, New York, N. Y., 1945, 268 p.

Chesters, J. H. **Steel Plant Refractories, Testing, Research and Development.** United Steel Companies, Ltd., Sheffield, England, 1944, 509 p.

Comber, A. W. **Magnetite as a Refractory.** J. B. Lippincott, Philadelphia, Pa., 1938, 114 p.

Curtis, F. W. **High Frequency Induction Heating.** McGraw-Hill Book Co., Inc., New York, N. Y., 1944, 235 p.

Eitel, Wilhelm. **Physikalische Chemie der Silikate.** Ed. 2, rev. J. A. Barth, Leipzig, 1941, 826 p.

Etherington, Harold. **Modern Furnace Technology.** Charles Griffin and Co., Ltd., London, 1938, 524 p.

Etherington, Harold. **Modern Furnace Technology.** Ed. 2, Tait Book Co., Melbourne, 1944, 522 p.

Griswold, John. **Fuels, Combustion and Furnaces.** McGraw-Hill Book Co., Inc., New York, N. Y., 1946, 496 p.

Gunz, Wilhelm. **Kurzes Handbuch der Brennstoff und Feuerungstechnik.** Julius Springer, Berlin, 1942, 447 p.

Harbison-Walker Refractories Co. **Modern Refractory Practice.** Ed. 2. Company, Pittsburgh, Pa., 1937, 295 p.

Heiligenstaedt, Werner. **Wärmetechnische Rechnungen fuer Industrieöfen.** Ed. 2. Verlag Stahleisen, Duesseldorf, 1941, 340 p.

Hoffmann, Fritz and Tingwald, Carl. **Optische Pyrometrie.** Vieweg & Sohn, Braunschweig, 1938, 134 p.

Jouguet, Marc. **Courants de Foucault et fours a induction.** Gauthier-Villars, Paris, 1944, 163 p.

Letort, Y. **Produits refractaires; matieres premieres, fabrication, usage.** Librairie Dunod, Paris, 1945, 199 p.

Lincoln, E. S. **Industrial Electric Heating and Electrical Furnaces.** William Collins & Co., Toronto, Canada, 1946, 192 p.

McAdams, W. H. **Heat Transmission.** Ed. 2, rev. & enl. McGraw-Hill Book Co., Inc., New York, N. Y., 1942, 459 p.

Norton, F. H. **Refractories.** Ed. 2. McGraw-Hill Book Co., Inc., New York, N. Y., 1942, 798 p.

Okorokov, N. C. **Electric Melting Furnace in Ferrous Metallurgy.** Moscow, 1945, 440 p. (In Russian.)

Paschkis, V. A. **Industrial Electric Furnaces and Appliances.** Interscience Publishers, Inc., New York, N. Y., 1945, v. 1, 232 p.

Searle, A. B. **Refractories for Furnaces, Kilns, Retorts, Etc.** C. Lockwood & Son, Ltd., London, 1939, 102 p.

Searle, A. B. **Refractory Materials: Their Manufacture and Uses.** Ed. 3, rev. & enl. Charles Griffin & Co., Ltd., London, 1940, 895 p.

Sosman, R. B. **Pyrometry of Solids and Surfaces.** American Society for Metals, Cleveland, 1940, 98 p.

Trinks, Willibald. **Industrial Furnaces.** Ed. 2. John Wiley & Sons, Inc., New York, N. Y., 1942, v. 2, 351 p.

Weber, R. L. **Temperature Measurement and Control.** Blakiston Co., Philadelphia, Pa., 1941, 430 p.

Wood, W. P. and Cork, J. M. **Pyrometry.** Ed. 2, rev. McGraw-Hill Book Co., Inc., New York, N. Y., 1941, 265 p.

Wundram, O. **Elektrowärme in der Eisen und Metallindustrie.** Julius Springer, Berlin, 1939, 64 p.

IT WAS POOR STEEL... that helped stock the world's richest locker*

* Davey Jones' Locker—tomb of dead ships, and fabulous treasure. Much of this tragic waste resulted from sloppy heat treating of ships' chains, cables, brackets, bulkheads, and other vital steel parts that failed under stress.

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Steel specimens coated with a mixture of powdered aluminum and aluminum oxide were heated to 1300° C., at which temperature Al displaced the oxygen in the pores of the sample. Data are tabulated.

10b-13. Ferrocyanide Photocolorimetric Method for Determination of Vanadium. (In Russian) R. V. Vorontosov. *Zavodskaya Laboratoriya* (Factory Laboratory) v. 13, Oct. 1947, p. 1155-1157

Method is applicable to pure salts and to Cr-Ni-V steels and gave satisfactory results for concentrations of Vanadium from 0.05 to 2.26%.

10b-14. Rapid Method for Phosphorus Determination in Steel. (In Russian.) B. Ya. Barkov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 13, Oct. 1947, p. 1253-1254.

Proposes a series of improvements by which the time required is claimed to be reduced from 25 or 30 min. to about 13 min.

10c—Nonferrous-Base Metals

10c-5. Spectrographic Analysis of Nickel Alloys. C. J. Neuhaus. *Iron Age*, v. 161, Jan. 22, 1948, p. 62-65.

Some interesting and unusual analytical techniques. Methods that provide for the analysis of thin materials, materials in low concentration, and small areas such as inclusions and cracks.

10c-6. Mode Rapide d'Identification, par Voie Microchimique, des Moindres Parcelles de Cobalt et de Nickel a l'Etat Métallique. (Rapid Method of Identification, by Microchemical Means, of Minute Particles of Metallic Cobalt and of Nickel). Georges Deniges. *Comptes Rendus* (France) v. 225, Nov. 10, 1947, p. 841-843.

Detailed report of methods.

10c-7. Hydrogen Content of Electrolytic Chromium and Its Removal. E. V. Potter and H. C. Lukens. *Metals Technology*, v. 15, Jan. 1948, T.P. 2312, 8 pages.

In an earlier investigation, the gas content of electrolytic manganese was determined and methods developed for removing most of it without detrimentally affecting the properties of the metal. Results of a similar investigation and use of a similar removal method on electrolytic chromium.

10c-8. Removal of Manganese in Determinations of the Zinc, Calcium, and Magnesium of Manganese Ores and Products. Robert L. Evans. *Analytical Chemistry*, v. 20, Jan. 1948, p. 87.

The precipitation of Mn from concentrated HNO_3 solutions by potassium chlorate is a standard "separation" method in its determination. It was found that this precipitation was an excellent Mn "removal" method in determining Zn, Ca, and Mg contents of high Mn ores and products.

10c-9. Analysis of Copper and Nickel Slags and Mattes. J. Kinnunen. *Metallurgia*, v. 37, Jan. 1948, p. 153-156.

Simple and rapid methods which have been found to give satisfactory results. 14 ref.

10c-10. Determination of Copper in Tin Bronzes and Brass Without Separation of Tin. (In Russian.) G. I. Veitsblit. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 13, Oct. 1947, p. 1255.

New method using a mixture of HF and HNO_3. Drawback is action of this solution on glass.

10c-11. Zur Quantitativen Bestimmung des Bleis als Salz der Gallussäure. (Quantitative Determination of Lead as a Salt of Gallic Acid). C. Maye. *Monatshefte fur Chemie*, v. 77, 1947, p. 5-75.

A method involving conversion to lead sulphate.

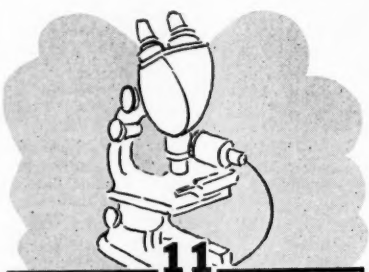
10d—Lightweight-Base Metals

10d-5. Determination of Small Amounts of Beryllium by Fluorescence Measurement. A. B. Carlson, W. F. Neuman, and A. L. Underwood. *Atomic Energy Commission*, MDDC 941, Feb. 1947, 13 pages.

The fluorescence of alkaline beryllium solutions with quinizarin was studied; pH, dye concentration, and many common ions were shown to influence the fluorescence of the complex. An analytical procedure was developed for 1 to 10 micrograms of Be. The method can probably be extended to even smaller amounts.

10d-6. Determination of Magnesium Powder. (In Russian). V. I. Chugunova and A. P. Ivanova. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 13, Oct. 1947, p. 1163-1164.

Direct method based on solution of MgO by 5% CrO_3, which does not react with metallic Mg.



11

APPARATUS, INSTRUMENTS and METHODS

11-18. Progress in Industrial Control Through Electrical Instrumentation. J. C. Mouzon. *Engineers' Digest* (American Edition), v. 4, Dec. 1947, p. 546.

Recent developments.

11-19. Vacuum Furnace for Laboratory Use. R. Kiessling. *Engineers' Digest* (American Edition), v. 4, Dec. 1947, p. 578-579. Translated and condensed from *Teknisk Tidskrift*, v. 77, no. 32, 1947, p. 586-587.

The furnace is suitable for temperatures up to 2200° C. It is heated by passing 200 to 500 amp. a.c. current through a graphite tube. It was used for investigation of the Cr-B and Ni-B systems, as well as for many other purposes.

11-20. Ultra High-Frequency Sound Waves Measure Thickness of Metal From One Side. Norman G. Branson. *Oil and Gas Journal*, v. 46, Jan. 22, 1948, p. 66, 69, 71.

Principles and applications of the "Audigage".

11-21. Electrical Conductivity Tests Facilitated by Improved Fixture. *Steel*, v. 122, Feb. 2, 1948, p. 112.

At General Electric's Fort Wayne works, rotors for small induction motors are pressure cast of aluminum. Control of conductivity of aluminum is an important factor in the manufacture of high-quality motors. An improved fixture.

11-22. Torque and Thrust Measurement Aid Bearing Testing. *Steel*, v. 122, Feb. 2, 1948, p. 119.

Instrument called "Thrustorq" is so sensitive and accurate that it will measure the reactive force of a single turbine blade or the thrust of a giant jet engine.

11-23. Laboratory Handling of Radioactive Material. Paul C. Tompkins. *Atomic Energy Commission*, MDDC-1414, Oct. 22, 1947, 26 pages.

Recommended techniques and tools.

11-24. Concave Metallic Replica Gratings. I. Simon. *Review of Scientific Instruments*, v. 18, Dec. 1947, p. 894-896.

Method is described for producing metallic replicas from gratings by electrodeposition of copper. It is possible to obtain concave replicas from a convex original grating—either metallic or glass.

11-25. An Electronic Analytical Balance. John W. Clark. *Review of Scientific Instruments*, v. 18, Dec. 1947, p. 915-918.

An electronic instrument which will weigh small objects with precision comparable to that of the chemical beam balance. It is faster to use and requires less skill on the part of the operator than does the mechanical balance.

11-26. Sample Holder for Reflection Type Samples to Be Used in the G. E. Electron Diffraction Instrument. Eileen I. Alessandrini. *Review of Scientific Instruments*, v. 19, Jan. 1948, p. 52-53.

Holder makes it possible to photograph five different samples without having to break the vacuum each time a new specimen is to be examined.

11-27. Single Crystals; Methods of Production—Correction of Imperfections. *Metal Industry*, v. 72, Jan. 23, 1948, p. 71, 73.

Work which has been done with single crystals as an aid to metallurgical research.

11-28. Basic Principles and Application of X-Ray Crystallography. Stanley Siegel. *Frontier*, Dec. 1947, p. 15-19.

11-29. Adherence of Porcelain Enamel to Base Metal Measured by New Testing Apparatus Using Magnetic Counting Principle. *Steel*, v. 122, Feb. 16, 1948, p. 112. Also **Testing Instrument Measures Porcelain Enamel Adherency by Magnetic Counting.** *Products Finishing*, v. 12, Feb. 1948, p. 90.

Instrument developed by the Research Foundation of the Porcelain Enamel Institute in the National Bureau of Standards.

11-30. Metallography of Hot-Dipped Galvanized Coatings. D. H. Rowland. *Western Machinery and Steel World*, v. 39, Jan. 1948, p. 88-89, 110. A condensed version.

Previously abstracted from Preprint No. 18, 1947, American Society for Metals, Cleveland. See item 11-128, R.M.L., v. 4, 1947.

11-31. X-Ray Determination of Retained Austenite by Integrated Intensities. B. L. Averbach and M. Cohen. *Metals Technology*, v. 15, Feb. 1948, T.P. 2342, 14 pages.

An X-ray method based on integrated intensities developed for determination of retained austenite in hardened steels. No external calibration or standard reference foil is necessary and the procedure can be applied to steels in the as-hardened condition prior to any tempering treatment. Comparison of results with those obtained by lineal analysis indicate that those obtained by the latter procedure tend to be on the low side, even though unusual precautions are taken, when dealing with the range under 15% retained austenite. 16 ref.

11-32 Plastic Replicas for Surface-Finish Measurement. J. Pearson and M. R. Hopkins. *Journal of the Iron and Steel Institute*, v. 158, Jan. 1948, p. 138.

The methods hitherto described are said to be unsuitable for roughness measurements by stylus instru-

(Turn to page 30)

Foley Speaks on Heavy Forgings

Canton-Massillon Chapter Observed President's Night on Feb. 5. O. J. Horger of the Timken Roller Bearing Co., chapter chairman (left), introduced the national president, Francis B. Foley (center). S. W. Poole of Republic Steel Corp., a past chairman, is at right. Mr. Foley's discussion of "Heavy Forgings" was based on his experience of over 40 years with the Midvale Co., where he is director of research. (Reported by J. C. Selby, Timken Roller Bearing Co.)

Specimen Preparation for P-V Test Is Simple, Rapid

Reported by Joseph A. Graber
Assistant Supervisor of Methods
Revere Copper & Brass, Inc.

The development of the P-V test by B. F. Shepherd of Ingersoll-Rand Co. created an economical and accurate method for determining the hardenability of shallow hardening toolsteels, A. O. Crobaugh told the Baltimore Chapter A.S.M. at the meeting on Jan. 23. Mr. Crobaugh, also of Ingersoll-Rand, served as pinch-hitter for Mr. Shepherd.

Preparation of the specimen is simple and fairly rapid. The standard test specimen is 1⅛ in. long with a 90° included angle. After heating, it is quenched in a special quenching fixture. A sample is then cut from the center and surface ground. The depth of hardness penetration is determined with the Rockwell hardness tester using the N-30 scale.

Use of a micrometer stage incorporated with the Rockwell elevating screw permits depth readings of high accuracy. Readings 0.015 in. apart are standard when using the N-30 scale, numerous charts and tables were used to illustrate the talk.

The Reviewing Stand

DESPITE WAR'S END the bureaucratic red tape winds on. A particularly exasperating example comes to light in a letter from a Review-of-Metal-Literature fan, whom for convenience we shall designate as Mr. S. "In *Metals Review* for October 1947," he writes, "Abstract No. 2-221 is a report from Headquarters, Air Materiel Command, Wright Field, Dayton, Ohio; Technical Report F-TR-1150-ND, August 1947. This report is of interest to me, and I therefore wrote to the Headquarters, Air Materiel Command, at Wright Field and received the usual form letter saying that (*a*) technical intelligence information cannot be distributed to individuals until they establish their connection with a government contractor, and (*b*) material of a nonclassified nature can be secured by individuals from the Office of Technical Services, Department of Commerce.

"On the assumption that material of a classified nature would not be permited to appear in the public press (in which category I'm sure *Metals Review* falls), I wrote to the Department of Commerce quoting only the report number. The Office of Technical Services was unable to identify the report from its number alone (although they opined that it just might possibly be Army Air Forces Report 1150!).

"The Office of Technical Services went on to say that they did not have Army Air Forces Technical Report 1150, but that if it were needed for work which was under Government contract it might be secured from Wright Field. And so the merry-go-round turns."

Mr. S—a patient man—dispatched another letter to the Office of Technical Services, giving the entire title and reference numbers for the report, but we haven't yet heard whether he finally broke through the barrier. At any rate, the Battelle Library was able to loan him its copy for a period of a week, which we hope was of some help.

Mr. S concludes his letter very kindly by saying, "This little matter does not reflect at all on the excellence of *Metals Review* and its utility to those fortunate enough to receive it. I wish only to point out that an extraordinary amount of perseverance is sometimes required to secure technical information."

We shall refrain from making any pointed and obvious comments about this matter of perseverance, but we might timidly suggest amending the last sentence by adding: ". . . despite the 'most timely and prompt abstracting service in the world turned out by the A.S.M.' "*

Punch Card Filing

We have already called attention in this column to the excellent article in the December issue of *Metal Progress* on "A Punch Card Filing System for Metallurgical Literature". This article has aroused a great deal of interest among A.S.M. readers, and we now have an inquiry that reads as follows:

"This article carries a rather extensive code on metallurgical subjects, and we wish to inquire if you know of any code along these lines having been developed for other manufacturing practices, such as foundry, forging, machining, and welding."

We don't, but we'd be glad to hear about such a breakdown and forward the information to our correspondent if anyone can give us a lead. M.R.H.

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* See *Metals Review* for February, The Reviewing Stand, page 9.

ments. The technique outlined is of more general applicability, as it requires no heating and can be used to make negative surface replicas from objects of any size, roughness, or location.

11-33. Supersonic Flaw Detectors. Donald C. Erdman. *Electrical Engineering,* v. 67, Feb. 1948, p. 181-185.

How echo techniques similar to those of sonar and radar are used to locate hidden defects inside solid metal objects.

11-34. Alternating Current Measurements of Magnetic Properties. Horatio W. Lamson. *Proceedings of the I.R.E.,* v. 36, Feb. 1948, p. 266-277.

A critical analysis of various procedures for determining the permeability and core loss of ferromagnetic materials, together with a discussion of the limitations under which such observations are made and the interpretations which should be applied to the data obtained.

11-35. Improved Machine for Production of Polished Metallurgical Specimens. (In Russian.) N. M. Zarubin and A. I. Fraiman. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 13, Oct. 1947, p. 1257-1259.

Details of above machine.

11-36. Microfurnace for Determination of the Melting Point of Slags. (In Russian). P. V. Umrikhin and V. I. Dyachkov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 13, Oct. 1947, p. 1260-1261.

An improved "furnace" directly connected to the microscope.

For additional annotations indexed in other sections, see: 4a-7; 5a-6; 14a-14.

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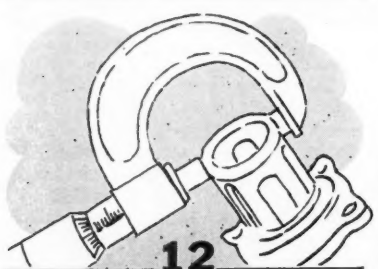


12 INSPECTION and STANDARDIZATION

12a—General

12a-13. X-Ray Gaging of Sheet and Strip Thickness. *Iron Age,* v. 161, Jan. 29, 1948, p. 69, 127.

Gage developed by Westinghouse Electric permits continuous measurement, roll-pressure control, and classification of metal sheet and strip. Other thickness-gaging uses are suggested.

12a-14. Lot Sampling of Screw Machine Parts. G. M. Bowen. *Iron Age,* v. 161, Jan. 29, 1948, p. 74-76.

A plan which reduces over-all defective volume by 28% and holds defectives to 2%. It also permitted a cut of more than 60% in inspection personnel.

12a-15. Gear Measurement Over Nonstandard Pins. Edward J. Rantsch. *American Machinist,* v. 92, Jan. 29, 1948, p. 301.

How to use nonstandard pins when standard ones are not available for checking gears during cutting or inspection.

12a-16. X-Ray Thickness Control Expected to Step Up Sheet Output. W. N. Lundahl. *Steel,* v. 122, Feb. 2, 1948, p. 101-102, 117-118.

Equipment which automatically rejects off-gage material in flying-shear installations or controls screwdowns to maintain uniform thickness in material coming off the cold mill. Potentialities for other uses.

12a-17. Identify Casting Defects. J. O. Vadeboncoeur. *American Foundryman,* v. 13, Jan. 1948, p. 56-59.

Methods used to identify the various types.

12a-18. A World Standard for Screw Threads. Kaare Heiberg. *Journal of Scientific and Industrial Research,* v. 6A, Sept. 1947, p. 351-358.

Problems involved in unifying the three systems now in use, proposed solutions, and the work which has been done along these lines. The differences between the British and American systems added over one billion dollars to the cost of World War II.

12a-19. Gear Tooth Inspection Method as an Index of Performance. L. D. Martin. *Product Engineering,* v. 19, Feb. 1948, p. 87-89.

Inspection data obtained by the pin-measurement method and the master-gear or rack method for checking the accuracy of gear-tooth elements.

12a-20. Gage-Zone System Harmonizes Delivery and Acceptance Inspection. John Gaillard. *American Machinist,* v. 92, Feb. 12, 1948, p. 100-105.

Proposed system of inspection assures that parts made to the vendor's gages will always pass the customer's gages.

12a-21. Electronic Inspection. *Aircraft Production,* v. 10, Feb. 1948, p. 52-54.

Principles and applications of the Cornelius comparator for checking structure, composition, flaws dimensional variations, hardness, surface-finish comparison, and stress-strain analysis.

12b—Ferrous

12b-3. Standard Stainless Steels, Wrought and Cast. *Metal Progress,* v. 53, Jan. 1948, p. 96B.

A tabulation.

12b-4. Notes on Radiology of Welded Pipe Joints. *Combustion,* v. 19, Jan. 1948, p. 44.

Reviews paper by E. Thomas before the Institution of Mechanical Engineers (Great Britain.)

12b-5. Design Standards for Steel Water Pipe. Russell E. Barnard. *Journal of the American Water Works Association,* v. 40, Jan. 1948, p. 24-87.

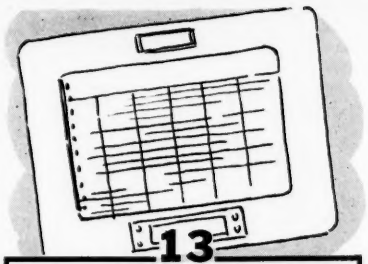
Extensive design data for steel water pipe lines from 6 to 36 in. in diameter. 16 ref.

12c—Nonferrous

12c-2. The Radiography of Heavy Radioactive Metals. Gerold H. Tenney. *Atomic Energy Commission,* MDDC 478; LADC 310, Nov. 13, 1946, 20 pages.

A method for radiographic inspection of uranium. A resolution of 2½% up to thicknesses of 4 in. was obtained, which was adequate for detection of air bubbles (the usual defect). Problems to be solved in improvement of the method.

For additional annotations indexed in other sections, see: 20a-50-70; 22b-53; 26a-16; 27b-13.



13 TEMPERATURE MEASUREMENT and CONTROL

13-6. The Embrittlement of Chromel and Alumel Thermocouple Wires. W. I. Pumphrey. *Journal of the Iron and Steel Institute,* v. 157, Dec. 1947, p. 513-514.

Embrittlement at temperatures above 800° C. in uncleaned stainless steel protecting sheaths. Oil or other carbonaceous or sulphur-bearing matter remaining in the protecting tube after manufacture may be the cause of the embrittlement; all stainless steel sheaths for use with chromel-alumel thermocouples should be thoroughly cleaned before use.

13-7. Sur la Determination Rapide de la Temperature de Recristallisation des Alliages. (Rapid Determination of Recrystallization Temperature of Alloys). Pierre Laurent and Michel Eudier. *Comptes Rendus* (France), v. 225, Nov. 24, 1947, p. 1011-1012.

Use of a thermocouple composed of a tempered wire and a cold-worked wire of the same metal to determine the recrystallization temperature of Cu-Zn alloys. An emf. is set up by such a combination.

13-8. Pyrometry for the Ceramic Industries; With an Introduction to Principles of Automatic Control. V. L. Parsegian. *American Ceramic Society Bulletin,* v. 27, Jan. 15, 1948, p. 1-24.

Recommended practices and sources of error in temperature measurement, together with a brief review of automatic-controller principles and types. 37 ref. (Presented at the 49th Annual Meeting, American Ceramic Society, Atlantic City, N. J., April 23, 1947.)

13-9. Automatic Temperature Control in the Finishing Department. Frank V. Faulhaber. *Products Finishing,* v. 12, Feb. 1948, p. 18-20, 22, 24, 26, 28.

General recommendations.

13-10. Measurement of Gas Temperatures by Means of Thermocouples. W. L. Bolles. *Petroleum Refiner,* v. 27, Feb. 1948, p. 94-100.

Chemists and engineers all too frequently ignore the large errors which are likely to occur. Danger of error, methods for estimating the extent of error, practical methods of reducing it, and the principal methods used.

13-11. Temperature Control in Open-hearth Furnaces. (In Russian). V. S. Kocho. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 13, Oct. 1947, p. 1209-1215.

Various methods were investigated. Results indicate that the highest possible temperature should be maintained just below the center of the crown. Diagrams show construction and location of suitable apparatus for determining the temperature at this point and also the radiation of the flame.

(Turn to page 32)

Published Knowledge on Fundamentals of Carbide Systems Needed

Reported by W. L. Badger
General Electric Co., River Works

Describing the hardness of cemented carbides as "synthetic" hardness, Lee H. DeWald of the division of industrial cooperation, Massachusetts Institute of Technology, addressed the Boston Chapter A.S.M. on Jan. 9 on "Cemented Carbides and Their Proper Application". Synthetic hardness, he said, results from cementing small particles of an inherently hard material in a softer matrix. These synthetically hard materials are somewhat softer than the hard phase alone, but stronger and more capable of resisting severe operating conditions.

Hardness and specific surface of a synthetic carbide-binder system are controlled by the particle size distribution of the carbide—a fact that Mr. DeWald illustrated graphically. Since the binder film thickness decreases rapidly with an increase in the specific surface of the carbide, it is apparent that the physical properties of the cemented carbides will be extremely sensitive to slight changes in the composition of the binder. Stringent processing controls are imperative, therefore, to insure a consistent product.

Hot hardness is attributed to the small percentages of binder (usually cobalt) used in the compositions and the limited solubility of the predominating carbide in the binder. To prevent the tendency of the hot chip, during steel cutting, to alloy with the cobalt and cause a crater, a small percentage of a carbide more soluble in the binder may be added to the composition. In this way, a non-seizing alloy binder is formed which reduces chip friction and acts as if it were an internal lubricant.

Cementing Heat Treatment

The cementing heat treatment is a complex mechanism that is governed by particle size distribution; amount, purity, and distribution of the binder; the pressing pressure; and the furnace atmosphere. The pressed compacts are often embedded in a material such as alundum or graphite during cementing to control the properties of the finished compact. Strength is increased with the approach to stoichiometric carbon with a concomitant sacrifice of wear resistance. Consequently in most commercial grades, where wear resistance is essential, a slight deficiency in carbon is beneficial.

In analyzing any application it is necessary to consider the fundamental factors involved. A simple wear application, in which no great amount of heat is generated, is somewhat less complicated than the metal cutting operation. Wear at room temperature depends upon the magnitude of the abrading area, the pressure exerted over that area, the condition of the surfaces in contact, and the chemical affinities of the sliding surfaces. Important applications in this category are dies of various types.

The metal cutting operation involves a more accurate appraisal of such factors as the physical properties and microstructure of the material being cut. The type of application requires determining depth of cut, feed, speed, the continuity and regularity of cut and the condition of the machine tool. From these general factors, the grade of carbide and design of tool are determined. Failure may result from improper handling, improper design, abrasion, seizing, corrosion or fatigue.

The continued decrease in the cost of carbides, better operator training and improved production techniques have all helped to widen their application. In spite of this widespread use, little has been published on the fundamental physical chemistry of these systems. It is hoped that in the near future the carbide industry will enter that phase of development presently enjoyed by the more well-known metal industries in which there seems to be a spirit of cooperative competition to publish results.

Lee H. DeWald of Massachusetts Institute of Technology (Right) was the Principal Speaker at the January Meeting of the Boston Chapter; His Subject Was Cemented Carbides. Prof. John Wulff (left) was technical chairman, and Dr. Maira Telkes (center), also of M.I.T., gave the coffee talk on "Solar Energy". (Photo by H. L. Phillips)

Technical Papers Invited

The Publications Committee of the A.S.M. will now receive technical papers for consideration for publication in the 1949 *Transactions*. A cordial invitation is extended to all members and nonmembers of the A.S.M. to submit technical papers to the society. Many of the papers approved by the committee will be scheduled for presentation on the technical program of the 30th National Metal Congress and Exposition to be held in Philadelphia, Oct. 25 to 29, 1948. Papers that are selected for presentation at the Convention will be preprinted and manuscripts should be received at A.S.M. headquarters office not later than April 15, 1948.

Manuscripts in triplicate, plus one set of unmounted photographs and original tracings, should be sent to the attention of Ray T. Bayless, assistant secretary, American Society for Metals.

Headquarters should be notified of your intention to submit a paper, and helpful suggestions for the preparation of technical papers will be sent.

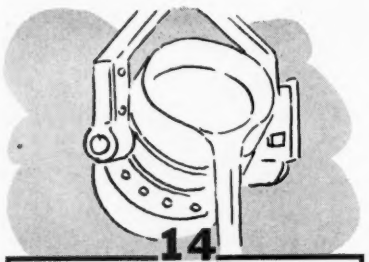
Castings Council Organized

A National Casting Council, representing eight individual technical and trade societies, has been formally organized. Purpose of the council is to provide a medium for cooperative action among its members on matters of mutual interest.

The founding members are the American Foundrymen's Association, Foundry Equipment Manufacturers Association, Foundry Supply Manufacturers Association, Gray Iron Founders' Society, Malleable Founders' Society, National Founders Association, Non-Ferrous Founders' Society, Inc., and Steel Founders' Society of America. Frank G. Steinebach, editor of *The Foundry*, is secretary of the council.

13-12. Measurement of Temperature by Means of Resistance Thermometers Made of Semiconductors. (In Russian) B. T. Kolomiets and I. T. Sheftel. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 17, Oct. 1947, p. 1105-1110.

Proposes use of UO_2 the resistance of which changes markedly with temperature. Methods for production of such thermometers and data on their characteristics and performance.



FOUNDRY PRACTICE

14a—General

14a-13. New Electro-Alloys Foundry in Production. *Industrial Heating,* v. 15, Jan. 1948, p. 54-56, 58, 60, 62, 64, 164.

Procedures and equipment in new foundry of Electro-Alloys Division of American Brake Shoe Co.

14a-14. The Scientist in the Foundry. C. R. Tottle. *Foundry Trade Journal,* v. 83, Dec. 25, 1947, p. 347-349.

Use of ultrasonic vibrations, radioactive isotopes, and a transparent silica window in a mold to facilitate investigation of conditions within. Use of a mirror dilatometer inserted in the mold wall, and a manometer for measuring internal pressure in castings. (Condensed from paper presented to the Institute of British Foundrymen.)

14a-15. Patternmaking and Foundry Practice. S. A. Horton. *Foundry Trade Journal,* v. 84, Jan. 1, 1948, p. 13-14.

Presidential Address to East Midlands Branch of Institute of British Foundrymen.

14a-16. Foundry Mechanization; Principles—Application to Nonferrous Alloys—the Human Problem. G. Skript. *Metal Industry,* v. 72, Jan. 16, 1948, p. 43-47. Also **Mechanization of Nonferrous Foundries,** *Foundry Trade Journal,* v. 84, Jan. 15, 1948, p. 51-57.

Based on paper presented before a joint meeting of the Institute of British Foundrymen and the Institute of Metals.

14a-17. A Foundry Goes Modern. *Business Week,* Jan. 31, 1948, p. 39-40, 42.

A picture story of new mechanized foundry of Fairbanks-Morse, Freeport, Ill.

14a-18. An American Observes European Foundry Methods. R. E. Fisher, Jr. *American Foundryman,* v. 13, Jan. 1948, p. 51-53.

Observations made in England, Scotland, France, Belgium, Czechoslovakia, and Switzerland.

14a-19. Metallurgy in the Foundry. James G. Dick. *American Foundryman,* v. 13, Jan. 1948, p. 60-61.

The practical value of the metallurgist's work in the production foundry.

14a-20. Unusual Shakeout Arrangement Speeds Sand Conditioning. *Iron Age,* v. 161, Feb. 5, 1948, p. 75.

Arrangement, in which sand from a mechanical shakeout unit is fed directly into a "Screenerator" which deposits it, conditioned, into a heap available for reuse.

14a-21. Determinable Variations in Close Tolerance Castings. L. M. Nielsen. *Foundry,* v. 76, Feb. 1948, p. 72-73.

Tolerances to be expected using different methods and materials for construction of patterns, molds, and cores. Use of metal driers.

14a-22. Foundry Parting Compounds. Hiram Brown. *Foundry,* v. 76, Feb. 1948, p. 74-75, 114, 117.

Various mixtures and materials used. Simple techniques for determining apparent specific gravity and waterproofing characteristics.

14a-23. Properties of Sand Cores. Victor Rowell. *Foundry,* v. 76, Feb. 1948, p. 80-81, 198, 200, 202, 204, 206.

Recommended compositions, and test procedures for evaluating the raw materials and the cores. (Based on paper presented at 10th annual Wisconsin Regional Foundry Conference).

14a-24. Cutting Foundry Costs With the Right Tool for the Job. D. S. Linton. *Foundry,* v. 76, Feb. 1948, p. 84-87, 248, 250, 252.

Previous articles in this series have discussed methods of cutting portable grinding-tool costs in the foundry by correcting defects in air conditions and by maintaining air equipment at the maximum point of efficiency. This article discusses opportunities for cutting costs by "application engineering", that is, by carefully selecting the right tool for the individual job.

14a-25. Plastic Matchplates Made by New Process. D. W. Talbott and J. L. Lessman. *Foundry,* v. 76, Feb. 1948, p. 194-196.

New method in which matched, integral-pattern units are inserted into wood or metal plates, thus eliminating use of screws or external fastening devices. Advantages.

14a-26. Pneumatic Straightener Reclaims Foundry Core Rods. *Compressed Air Magazine,* v. 53, Feb. 1948, p. 44.

14a-27. Situation et Evolution de la Technique des Isolants en Fonderie. (Situation and Evolution of the Technique of Binders for Foundry Use). Pierre Nicolas. *Fonderie,* Oct. 1947, p. 843-852.

Composition and methods of preparation of various core binders, mold-lining materials, and parting compounds used in France. Compares them with British and American materials and makes suggestions for improvement of French materials.

14b—Ferrous

14b-16. Centrifugal Casting Proves Advantageous for Iron Piston Rings. Tracy C. Jarrett and Erle J. Hubbard. *Materials & Methods,* v. 27, Jan. 1948, p. 79-82.

Development of a new alloy cast iron improved by new casting and heat treating procedures. Properties and structures are compared with those of standard gray cast iron piston-ring materials.

14b-17. Uses of Exothermic Cores in Pouring Stainless Steel. Maurice Beam. *Steel,* v. 122, Jan. 26, 1948, p. 76, 78.

In addition to exothermic cores or ring inserts placed under feeding heads, an exothermic powder is placed on top of the risers immediately after filling the mold. This compound generates additional heat which maintains fluidity of the metal so that feeding continues during solidification—the riser being the last to freeze. Composition of the exothermic material is not indicated.

14b-18. Centrifugal Casting Process Applied to Stainless and Carbon Steel Tubes. J. W. Moore and J. W. MacKay. *American Foundryman,* v. 13, Jan. 1948, p. 41-49.

Previously abstracted from *Mechanical Engineering,* July 1947. See 14-203, R.M.L. v. 4, 1947 (*Metals Review,* Aug. 1947).

14b-19. Priciny Vzniku Spendlikovych Poru u Ocelolitiny. (Causes for Formation of Pinholes in Steel Castings.) Josef Pribyl. *Hutnické Listy* (Metallurgical Topics), v. 2, no. 5, 1947, p. 106-110.

Tests were conducted to determine the causes of pinhole formation. Sands of various compositions were used, having a wide range of properties.

14b-20. Mechanization Speeds Malleable Output. H. Lyon Day. *Iron Age,* v. 161, Feb. 5, 1948, p. 64-69.

Equipment and procedures at the malleable iron foundry of Auto Specialties Mfg. Co.

14b-21. The Manufacture of Some Large Castings for Marine Engineering. D. H. Young. *Foundry Trade Journal,* v. 84, Jan. 8, 1948, p. 27-33; Jan. 15, 1948, p. 59-63.

Patternmaking and coremaking, and casting of large turbine castings of complex design.

14b-22. Old Foundry Has Face Lifted. Pat Dwyer. *Foundry,* v. 76, Feb. 1948, p. 76-79, 112, 114.

Modernization of 41,000 sq. ft. ferrous foundry.

14b-23. Internal Risers on Steel Castings. Turney Shute. *Foundry,* v. 76, Feb. 1948, p. 82-83, 236.

Advantages and disadvantages for different types and sizes of castings. (Presented at First All-Canadian A.F.A. Chapter Conference, Toronto, Canada.)

14b-24. Cupola Charge Calculations. Richard W. Heine. *Foundry,* v. 76, Feb. 1948, p. 88-89, 172, 174, 176.

An example of one method for calculating a metal charge to melt down a gray cast iron of a particular chemical composition.

14b-25. Magnesium Use in an Iron Foundry. A. J. Marotta. *Foundry,* v. 76, Feb. 1948, p. 208-210, 212, 214.

Use of magnesium flasks, core plates and radiator vent boards at Utica Radiator Corp., Utica, N. Y.

14c—Nonferrous

14c-5. A Strickled Core for a Lead Pot. W. Gudgeon. *Foundry Trade Journal,* v. 84, Jan. 1, 1948, p. 11.

Core design for production of pots for melting lead.

14c-6. Die Casting Progress. Part II—Zinc Alloy Die Casting. A. C. Street. *Metallurgia,* v. 37, Dec. 1947, p. 67-70.

14c-7. Chromium-Base Alloys; Developments for High-Temperature Service. *Metal Industry,* v. 72, Jan. 9, 1948, p. 28.

Discusses recent paper by Parke and Bens in which elaborate vacuum melting and casting methods are described.

14c-8. Sound Zinc-Base Alloy Die Castings. Ralph F. Burns. *Plating,* v. 35, Feb. 1948, p. 132-134.

Five elements which are essential to the production of sound die castings. Reviews a paper by George Werley which appeared in *ASTM Proceedings* for 1934 and dealt with a study of the effects of changes in die design on the properties of simple test bars. Changes made by Werley to achieve minimum porosity and uniformly high impact values are analyzed.

14c-9. Pacific Brass. *Western Metals,* v. 6, Jan. 1948, p. 30-31.

Equipment and procedures of Pacific Brass Foundry, San Francisco.

(Turn to page 34)

Efficient Use of Available Toolsteels Speeds Production

Reported by J. T. O'Connor

Assistant Metallurgist
Firestone Tire & Rubber Co.

Speaking on "Toolsteel — the Key to Efficient Production" before the Akron Chapter A.S.M. on Sustaining Members Night, A. J. Scheid, Jr., asserted that one of our present problems is the uninterrupted flow of manufactured goods into the world market. This involves the question of what can be done to meet production needs, quality-wise, quantity-wise, and profit-wise. Taking the greatest advantage of the toolsteel available will be a contributing factor, said Mr. Scheid, who is chief metallurgist for Columbia Tool Steel Co., Chicago Heights, Ill.

The present M-2 type of tungsten-molybdenum high speed steel has substantially increased alloy content and should not be confused with the early types. It is now generally agreed that it is of equal or greater efficiency than straight tungsten steels in most tools, and the prejudice against it due to lack of familiarity has largely passed.

Equipment for producing toolsteels has likewise improved. Better equipment for hardening tools with accurate temperature and atmosphere controls became available during the war. The Jominy end-quench under standardized conditions has become an accepted guide for experimental work and for product control. The mechanics of quenching have undergone a marked change, and extended tempering and double tempering have become recognized as essential to realize the full life of high speed tools. Special surface treatments such as nitriding and hard chromium plating are being used to an increasing extent.

It is the experience of Columbia Tool Steel Co., said Mr. Scheid, that of all the tool irregularities reported to them 75% still have their origin in heat treatment—taking the form of overheating, decarburization, strain cracking and insufficient tempering.

Time-temperature-transformation curves give a clear picture of the "why" of the quench. They show the effect of alloying elements, cooling speed, and time on the transformation products, and indicate the quenching medium necessary to bring about the desired results.

War experience demonstrated that surface condition also is a major factor in extending tool performance, a fine surface giving better life.

Mr. Scheid concluded his talk by saying that toolsteel performance is the key to production records. This begins with toolsteel selection, the application of sound methods of making and treating tools, and new techniques where they will prove valuable. He paid tribute to the toolsteel field men who have a world of information at their command and can give invaluable help when they are taken into the user's confidence.

Hardenability Test Demonstrated in Class

Prof. Robert W. Raudebaugh, University of Rochester (Left) and Ermanno A. Basilio, Chief Metallurgist of General Railway Signal Works, Beside Provisional Jominy Quench Equipment at Rochester Class

Reported by Robert S. Guinan

Eastman Kodak Co.

The educational class of Rochester Chapter A.S.M. was treated to a Jominy hardness demonstration on its Jan. 28th meeting. Ermanno Basilio, chief metallurgist of the General Railway Signal Co. and guest lecturer, conducted the test in the University of Rochester's metallurgical laboratories. Mr. Basilio's laboratory work, culminating two evenings' classwork, was presented before one of the largest turnouts of the current series.

Robert W. Raudebaugh, assistant professor of metallurgy at the University of Rochester, assisted Mr. Basilio. Following the test, Jominy curves were plotted from the data obtained.

The present lectures, a schedule of 18 being completed early in March, are devoted to the effect of alloying elements in steel. Professor Raudebaugh is presenting 15 of the lectures, with Mr. Basilio and Rea Hahn, superintendent of tubing manufacture, Rochester Products Division of General Motors, giving the remainder of the talks.

Powder Cutting Torch Severs Steel 66 In. Thick at High Speeds

Reported by G. W. Birdsall

Manager, Technical Editorial Service
Reynolds Metals Co.

The new Oxweld C-45 heavy duty cutting torch and the process of powder cutting were described in detail in a talk on "Recent Advances in Heavy Cutting" presented before the January meeting of the Louisville Chapter A.S.M by J. A. Hudson, supervisor of process service for the Linde Air Products Co. in Chicago.

The new torch consumes gas at rates up to 6000 cu. ft. per hr., cuts steel and other materials up to 66 in. thick, and handles heavy cutting operations in one-fifth to one-thirtieth the time required by former methods and with about 1% of the capital investment.

This torch can sever the top of a 276-ton hot-top ingot at the rate of 2½ in. of cut per min., compared with three or four days to cold-saw it. Large ingots can be readily sliced for metallurgical examination, thus aiding in tracing down ingot defects. A 12 × 12-in. cold bloom can be cut complete in 3 min. Forging stock can easily be given accurate, square-cut ends at the mill.

Powder cutting is a new development in which a metallic powder, rich in pure iron, is fed through openings between the preheat and oxygen jets in the nozzle. Special nozzles with these added openings and passageways can be used, or an attachment can be fitted to ordinary oxy-acetylene cutting nozzles. Powder is fed to the torch through a flexible line from a separate dispenser fitted with an air injector and devices to control powder flow.

With this method, heavy cuts can be made in stainless steel at the usual rates obtainable in ordinary carbon steel. Burning of the powder provides preheat and fluxing. This continuous preheating action also permits making uninterrupted cuts and cuts across openings in tubing and other shapes with voids up to 3 in. across. Loose bundled scrap, aluminum, cast iron, brass, and copper have been cut.

Foley Talks on Sigma Phase

Reported by John F. Collins

O'Brien Fellow in Metallurgy
University of Notre Dame

The meeting of the Notre Dame Chapter on Feb. 4 was addressed by National President Francis B. Foley, chief research engineer, Midvale Co., Philadelphia. He spoke on "The Sigma Phase in Heat Resistant Alloys". This is one of a series of talks which Mr. Foley is presenting before a large number of A.S.M. chapters during the current season.

14c-10. Making Metal Molds in Minutes. Harvey G. Groehn. *Western Metals*, v. 6, Jan. 1948, p. 42-44.

Use of several of the Wood's metal alloys which are produced by Cerro de Pasco Copper Co. in pouring or spraying for production of precision castings. Properties and applications.

14c-11. Small Castings Are Big Business. *Die Castings*, v. 6, Feb. 1948, p. 31-32.

Production and finishing of toy automobiles and hose nozzles by die casting Zn alloy.

14c-12. Plaster Molds for Casting Intricate Aluminum Torque Converter Parts. Herbert Chase. *Iron Age*, v. 161, Feb. 12, 1948, p. 60-68.

An unusual combination of plaster sections and dry-sand and plaster sections is used to produce the aluminum castings required for the Buick torque converter. This new molding technique, described for the first time, permits production of very intricate castings with high physical properties and with as-cast tolerances as small as ±0.010 in. A step-by-step description of their production and a number of sidelights of the process, including the use of plastic core boxes.

14c-13. L'Execution de Pieces Moulées en Cuivre. (Fabrication of Cast Copper Objects). Georges Blanc. *Fonderie*, Oct. 1947, p. 853-857.

Pure copper is difficult to cast, requiring constant precautions and causing numerous discards. Suggests ways to cut down the number of rejects.

14d—Light Metals

14d-9. Grain Size; Control in Magnesium Casting Alloys. V. C. F. Holm and A. I. Krynitsky. *Metal Industry*, v. 72, Jan. 23, 1948, p. 67-68. Condensed from *Journal of Research of the National Bureau of Standards.*

Previously abstracted from *Foundry*, v. 75, Oct. 1947, p. 81, 228, 230, 232, 234, 236, 238, 240. See item 14-296, R.M.L., v. 4, 1947.

14d-10. Die Casting Aluminum Rotors on a Vertical Hydraulic Press. *Machinery*, v. 54, Feb. 1948, p. 150-152.

Methods and equipment used at Westinghouse Electric Corp.

14d-11. Aluminum Alloy Castings. Floyd A. Lewis. *Foundry*, v. 76, Feb. 1948, p. 90-93, 154, 156.

Recommended practices in the production of sand molds and cores for aluminum castings. Third of series based on a survey sponsored by the Foundry Division of the Aluminum Assoc.

14d-12. Equilibrium Relations in Aluminum-Sodium Alloys of High Purity. W. L. Fink, L. A. Willey and H. C. Stumpf. *Metals Technology*, v. 15, Feb. 1948, T.P. 2339, 8 pages.

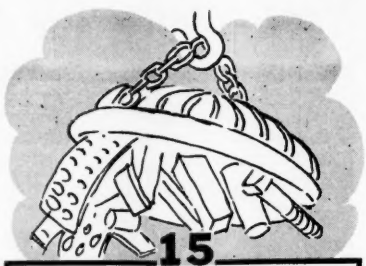
Results of precision measurements. 10 ref.

14d-13. Etat Actuel de nos Connaissances sur les Aciers Convenant a la Confection des Coquilles pour Coulée des Alliages d'Aluminium. (Present State of Knowledge of Steels Suitable for Manufacture of Molds for Aluminum Alloy Casting.) Marcel Bardot. *Fonderie*, Oct. 1947, p. 827-842.

A bibliographic report. 14 ref.

For additional annotations indexed in other sections, see:

2c-7; 12a-17; 16b-10-13; 18b-23; 21a-25; 23d-25; 24c-3; 25a-29.



15 SCRAP and BYPRODUCT UTILIZATION

15a—General

15a-2. The Treatment of Plating and Pickling Shop Wastes. E. W. Mulcahy. *Journal of the Eletcrodepositors' Technical Society*, v. 22, 1947, p. 227-242. (Preprint).

Methods of neutralizing acid from waste liquors and rinse water; the precipitation of chromium, copper, iron, etc.; the removal of cyanide in effluents; the construction of effluent treatment tanks of suitable acidproof materials; the measurement of flow and pH recording apparatus; the removal and scrubbing of nitrous oxide fumes from bright dipping plants; figures for intake air velocity on extractors; hard rubber as a protective lining for tanks and fan casings; study of the recovery of waste pickle liquors from industrial pickling plants; a plant for the crystallization of ferrous sulphate.

15b—Ferrous

15b-5. Steel Drum Reconditioning Speeded. *Iron Age*, v. 161, Jan. 22, 1948 p. 65.

Use of abrasive blasting.

15b-6. Maintenance With Stainless Electrodes. Joseph A. Cunningham. *Welding Engineer*, v. 33, Feb. 1948, p. 40-43.

Use of stainless steel electrodes in quarries, cement mills, railroads, steel mills, oil refineries, earth-moving, and other industries as a hard facing auxiliary.

15c—Nonferrous

15b-7. Reconstruction of a Steam Boiler. (In Russian) A. V. Makushin. *Avtogennoe Delo* (Welding), Oct. 1947, p. 22-23.

Welding repair procedures for a boiler damaged during the war.

15d—Light Metals

15d-2. Reclamation of Aluminum From Scrap. W. H. Dennis. *Mine & Quarry Engineering*, v. 14, Jan. 1948, p. 13-16.

Methods and equipment.

For additional annotations indexed in other sections, see:

1a-7; 2b-16; 7a-45; 7b-12; 22a-39-42; 22b-22-23-24-25; 25b-24; 27b-12.

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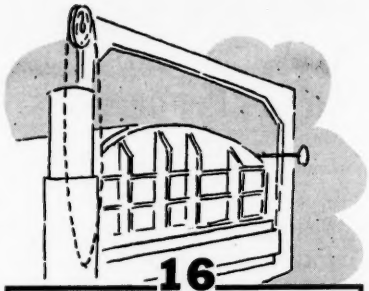


16 FURNACES and HEATING DEVICES

16a—General

16a-6. The Domain of Radio Frequency Heating. T. P. Kinn. *Scientific American*, v. 178, Feb. 1948, p. 66-69.

Principles and applications.

16a-7. The Brown Boveri Automatic Electrohydraulic Electrode Regulation for Electric Furnaces. *Brown Boveri Review*, v. 34, April-May 1947, p. 75-80.

16a-8. The Rotary Induction Heater; a New Means of Heating Metals Inductively Prior to Working. *Brown Boveri Review*, v. 34, April-May 1947, p. 81-85.

Fundamental principles of the induction heating process. Rotary heater and its performance.

16a-9. Power and Power Factor in Arc Furnace Operation. E. H. Browning. *Iron and Steel Engineer*, v. 25, Jan. 1948. p. 79-84; discussion, p. 84-86.

Electrical equipment requirements for operation and control; typical furnace characteristics; methods for improvement. 13 ref. (Presented at A.I.S.E. Annual Convention, Cleveland, Oct. 3, 1946.)

16a-10. How to Stop Fires in Induction Heating Equipment. E. E. Turkington. *Factory Management and Maintenance*, v. 106, Feb. 1948, p. 105-106.

16a-11. How to Maintain Infra-Red Ovens. Ira J. Barber. *Factory Management and Maintenance*, v. 106, Feb. 1948, p. 120-123.

16a-12. Un Nouveau Type de Fours a Arcs a Chargement Rapide. (A New Type of Rapidly Charged Arc Furnace). *Journal du Four Electrique et des Industries Electrochimiques*, v. 56, Feb.-Mar. 1947, p. 10-11.

A furnace of more than 6 tons capacity, which is rapidly charged by displacement of the vault and introduction of the whole charge at one time.

16a-13. Les Régulateurs Automatiques de Réglage d'Electrodes pour fours Electriques. (Automatic Controls for Regulating Electrodes in Electric Furnaces). L. Peytavin. *Journal du Four Electrique et des Industries Electrochimiques*, v. 56, April-May 1947, p. 27-29.

Necessity for controls to improve furnace output; methods and types of controls.

16b—Ferrous

16b-6. Large and Unique Furnaces Used in Manufacturing Propeller Blades at Hamilton-Standard Plant. *Industrial Heating*, v. 15, Jan. 1948, p. 22-24, 26, 28, 30, 32, 34, 36-38, 170, 172.

Procedures and equipment. The blades are hollow and are made of steel by various steps including upset forging, stamping, hot forming, heat treatment, annealing, brazing.

(Turn to page 36)

Snowflake Crystallography Related to Metals

Reported by M. G. Steele
Vice-President in Charge of Engineering
Kent Electric Corp.
and R. Carson Dalzell
Revere Copper and Brass, Inc.

Vincent J. Schaefer, the "snowflake scientist" from the General Electric Co. research laboratory, Schenectady, N. Y., told nearly 300 members of the Rome Chapter A.S.M. on Jan. 7 that he saw no reason why, at some future time, storms could not be modified, and hailstorms and serious icing eliminated.

While science has only scratched the surface of the last and least-known frontier, the atmosphere, and while man is a long way from controlling the weather, there is little or no reason why certain atmospheric conditions cannot be checked.

Using slides, the scientist described the work that the Army, Navy and Air Forces are doing in a restricted section of the Adirondacks. In the area, small storms are produced and studied. Whether snow or water can be produced from a cloud formation, said the speaker, can now be determined from optical conditions.

"Seeding" a cloud, Mr. Schaefer said, means the induction of crystals into a cloud so that other crystals will be produced. Water can be reduced to below-freezing conditions without the formation of ice, he pointed out, citing carefully performed experiments in which water was carried down to −38.5° C. The only thing that would make it form ice at that temperature was the introduction of crystal nuclei—stirring and vibration had no influence. This explodes a commonly accepted theory. When the water finally does freeze under these conditions, it becomes normal ice, and melts sharply at 0° C.

Vincent J. Schaefer (Left), General Electric Co.'s "Snowflake Scientist", is Greeted by Officials of the Rome Chapter Before His Evening Address on Jan. 7. Left to right are Robert C. Graham of Rome Cable Corp., a classmate of Mr. Schaefer's; L. R. Dickinson, program chairman; and M. G. Steele, publicity chairman of the chapter

While his talk dealt principally with snow, ice and water, he did remark that the replica technique used for capturing snowflake forms is very useful for metallographic work. He illustrated with comparative slides the facility with which replicas determine whether spots are raised or lowered areas on micrographic surfaces. The technique was described in the July 1943 issue of *Metal Progress*, page 72.

In connection with the replica technique, he mentioned that it would be very easy to build up a transparent model of metal crystals by taking replicas of one surface after another as the surface is gradually removed. This would be an interesting experiment if someone could be found with the patience to perform it.

Foley and Eisenman at Milwaukee

National President Francis B. Foley (Left) Addressed the Milwaukee Chapter's January Meeting. Shown with President Foley are Harold H. Zabel, chairman of the chapter, and National Secretary Eisenman (Photo by Walter F. Dickinson)

Metallurgical Aspects of Aircraft Industry Described

Reported by Clyde R. St. John
Senior Metallurgist
Permanente Metals Corp.

"Some Metallurgical Aspects of the Aircraft Industry" were discussed by Dana W. Smith, chief metallurgist of the research department, Permanente Metals Corp., before the January meeting, Inland Empire Chapter.

The talk covered many of the defects found in aluminum, magnesium, and steel parts and the steps taken to correct them. Slides were shown of segregations in aluminum extrusions and forgings and of poor bonds on clad products and their effect on stressed parts. Other subjects covered were aluminum-clad magnesium, dimpling of 75S sheet, arresting hooks for carrier-based aircraft landings, hydraulic tubes which failed in service, improperly degreased flash welded steel parts, and stress-cracked swaged tubing.

Dr. Smith concluded with the statement that although his talk emphasized metallurgical defects, in actual practice poor material quality is rarely encountered and plays only a minor role in the manufacture of an airplane. The principal responsibility of a metallurgist in an aircraft manufacturing plant is to ascertain that proper use is made of available materials and processes to yield a product capable of performing in accordance with its design.

16b-7. Construction and Repair of Openhearth Furnaces. D. C. Muir. *Journal of the Iron and Steel Institute,* v. 157, Dec. 1947, p. 481-491.

The furnace repair program at Consett Iron Co., Ltd., over a period of seven years, and a system of balanced repairs which enabled nine out of ten furnaces to be in production at any one time. Construction, life, replacement, and costs of refractories in various parts of the furnaces; the all-basic furnace; furnace insulation; conversion of the furnaces from producer gas to creosote-pitch, coke-oven or gas firing.

16b-8. The Design of Openhearth Gas Ports. M. P. Newby. *Journal of the Iron and Steel Institute,* v. 157, Dec. 1947, p. 601-608.

Experiments were conducted on a model of the gas port of a producer-gas-fired openhearth furnace to determine the efficiencies for converting pressure energy into kinetic energy of gas motion; resistance to stack gases was also measured. The designs tested have fairly high efficiency and changes can bring only limited improvement.

16b-9. Tower-Type Recuperative Electric Furnace for Continuous Bright Annealing of Sheet Steel. (In Russian.) O. A. Moschanskogo and I. A. Tvorogova. *Promyshlennaya Energetika* (Industrial Power), v. 4, Oct. 1947, p. 8-9.

An installation in which the coil of sheet steel moves first up through a tower, the top part of which consists of an electric furnace, and then back down through the same tower. This causes the heat liberated from the steel as it moves downward to be quite efficiently picked up by the steel moving upward, which latter is only a few inches away.

16b-10. The Induction Heated Cupola. *Iron Age,* v. 161, Feb. 5, 1948, p. 76-78.

In order to overcome the lack of quality coke and also to improve melting conditions for production of high-test irons and high-carbon alloy steel castings, use of a melting unit which combines the features of a cupola and an electric induction furnace was proposed by E. Piwowarsky of Germany. Some of the design considerations of such a unit, and constructional details of an experimental model.

16b-11. Progress in Openhearth Valve Design. *Steel,* v. 122, Feb. 9, 1948, p. 90, 93-94.

New types have cast-iron dampers closing to stack flue and separate gate valves closing to air fan, both held against the seat by air pressure and stack suction. Heat from waste gases is recovered by inflowing air.

16b-12. The Operation of a Gas-Fired Enameling Furnace. S. E. A. Ryder. *Gas Journal,* v. 253, Jan. 14, 1948, p. 113-114, 119.

Details of British installation, its operation, and performance. (Presented at 13th Annual Conference of the Institute of Vitreous Enamellers, Nov. 1947.)

16b-13. The High Frequency Furnace in the Steel Foundry. D. K. Barclay. *Journal of Scientific and Industrial Research,* v. 6A, Sept. 1947, p. 372-374.

16b-14. Some Features of Openhearth Furnace Design — Part IV. (Concluded.) G. Reginald Bashforth. *British Steelmaker,* v. 14, Jan. 1948, p. 34-41.

Tilting furnaces; mixed-gas furnaces; oil-fired furnaces; refractory materials.

16b-15. Hot and Cold Blast Mixing Device Gives to Blast a Uniform Temperature. H. E. McDonnell. *Blast Furnace and Steel Plant,* v. 36, Jan. 1948, p. 91-93.

Device recently introduced at Weirton Steel and its performance.

16b-16. Two 1500-Ton Blast Furnaces Now Under Construction at South Works, by Carnegie-Illinois Steel Corp. *Blast Furnace and Steel Plant,* v. 36, Jan. 1948, p. 94-98.

Details of design and materials being used.

16b-17. Dual Tempering Treatment Accomplished in One Operating Cycle by Continuous Draw Furnace. *Steel,* v. 122, Feb. 16, 1948, p. 104.

Furnace was designed and constructed by Holcroft & Co., Detroit. Parts processed are S.A.E. 5140 shafts with integral gears, machined from an upset forging and hardened to Rockwell C-57 to 61.

16b-18. Gaseous and Liquid Fuels in Iron and Steel Works; Engineering Aspects of Distribution and Utilization. J. B. R. Brooke and J. S. Bryan. *Journal of the Iron and Steel Institute,* v. 158, Jan. 1948, p. 111-124.

A British steelworks which was built 35 years ago, and has been altered and enlarged repeatedly since then. Diagrams show the fuel-gas distribution system, and means for its control and utilization, including burner design.

16b-19. Soaking Pits. *Journal of the Iron and Steel Institute,* v. 158, Jan. 1948, p. 125-137.

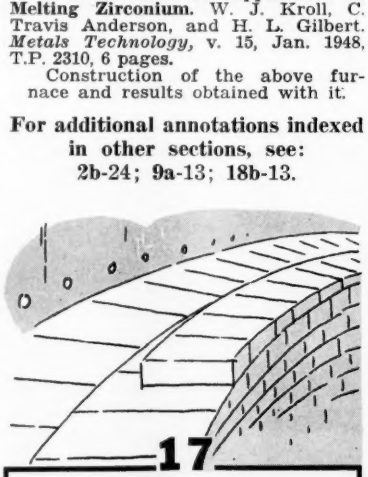
The main features and operation of four types of soaking pits of modern construction: reversing pit of the conventional type with new features; circular tangentially fired pit of the recuperative type; one-way fired pit of the recuperative type; and bottom-fired pit of the recuperative type. These four types were selected because the means of flame propagation are different, the conditions of gas flow are dissimilar, and the heating chambers contrast in size and shape; yet all successfully perform the process for which they were developed.

16c—Nonferrous

16c-1. A New Graphite Resistor Vacuum Furnace and Its Application in Melting Zirconium. W. J. Kroll, C. Travis Anderson, and H. L. Gilbert. *Metals Technology,* v. 15, Jan. 1948, T.P. 2310, 6 pages.

Construction of the above furnace and results obtained with it.

For additional annotations indexed in other sections, see: 2b-24; 9a-13; 18b-13.



17 REFRACTORIES and FURNACE MATERIALS

17-3. Ceramic Materials Show Promise for High-Temperature Mechanical Parts. Joseph R. Bressman. *Materials & Methods,* v. 27, Jan. 1948, p. 65-70.

Development of ceramics for use both as solid shapes and as coatings for metals for operating temperatures well above 1500° F.

17-4. Refractories and Forging Costs. H. J. Shaner. *Steel Processing,* v. 34, Jan. 1948, p. 41-43.

Refractories used in the lining of forging furnaces and their effect on forging costs. Benefits derived from use of control equipment and shock absorption devices.

17-5. Drying Stopper Rods at American Steel Foundry. *Industrial Heating,* v. 15, Jan. 1948, p. 112-113.

Rods are covered with a fireclay-bonded graphite sleeve. For every heat, each openhearth ladle must be equipped with a new rod properly heated and dried. Conveyer oven was developed for production-line drying of the rods.

17-6. Design and Performance of a Refractory Recuperator. *Industrial Heating,* v. 15, Jan. 1948, p. 114, 116, 118, 120, 178. Condensed from paper by E. G. Smith.

Performance data for a vertical-fired, ingot heating furnace equipped with integrated refractory recuperators. Air preheated by the waste gases is mixed with gas and burns at a vertical burner in the center of the furnace. Waste gas escapes at both sides through the recuperator system. Possibilities of the recuperative openhearth. (Presented at annual meeting of A.I.S.E., Pittsburgh.)

17-7. Ceramic Glazes for Combustion Chamber Linings in Gas Turbines. *Industrial Heating,* v. 15, Jan. 1948, p. 122, 124. Condensed from paper by Louis Navais presented at General Electric Science Forum.

17-8. The Development of Refractories for High-Temperature Industrial Processes. A. Hilliard and J. H. McKee. *British Coal Utilization Research Association Monthly Bulletin,* v. 11, Nov. 1947, p. 457-468.

A review. 118 ref.

17-9. Clays—Deflocculation and Casting Control. Part VII—Determination of Soluble Impurities in Slip Ingredients. G. W. Phelps. *Ceramic Age,* v. 51, Jan. 1948, p. 9-11.

Sources of trouble-making ions and practical methods of detecting these.

17-10. Oxygen Firing Furnaces of Industry Is Placing New Demands on Refractories. *Brick & Clay Record,* v. 112, Jan. 1948, p. 56.

17-11. Some of the Refractory Problems Faced in Research on Jet Propulsion Units. *Brick & Clay Record,* v. 112, Jan. 1948, p. 58, 60.

17-12. Atomic Energy for Industry Will Pose Intricate Problems for Refractories. *Brick & Clay Record,* v. 112, Jan. 1948, p. 62, 64.

17-13. Preparedness Marks Refractories Manufacturers Entry Into New Era. *Brick & Clay Record,* v. 112, Jan. 1948, p. 66, 68, 70, 72, 74, 76, 78, 80.

Various new developments.

17-14. Operating With a Basic Main Roof. A. K. Moore. *Blast Furnace and Steel Plant,* v. 36, Jan. 1948, p. 86-88.

Results obtained at Steel Company of Canada, Ltd., Hamilton, Ontario, including those with different design arrangements.

17-15. 38th Report of the Refractory Materials Joint Committee. The Behavior of Firebricks on Reheating. Summary, *Gas Times,* v. 54, Jan. 2, 1948, p. 53-54; discussion, p. 54, 56-57.

17-16. Observations on the Shelling of Checker-Brick. E. C. Petrie and D. P. Brown. *Journal of the American Ceramic Society,* v. 31, Jan. 1, 1948, p. 14-20.

Brick installed in glass-tank

(Turn to page 38)

Age Hardening Properties Exhibited by Five Nickel Alloys and Beryllium Copper

Reported by J. J. Preisler
Standards Engineer, Sperry Gyroscope Co.

A review of the age hardenable alloys of nickel and of copper was presented by William Mudge of the International Nickel Co. and Robert Carson of the Carson Micrometer Corp. at the January 12th meeting of the New York Chapter A.S.M.

Dr. Mudge restricted his talk to commercially available age hardening nickel alloys and to practical considerations; he disposed of the controversial theory of precipitation hardening by stating that age hardening may be imparted by an element which is more soluble in the base metal at elevated temperatures than at lower temperatures.

Fifteen elements may be considered as possible "hardeners" for nickel, but five of these give low hardening response or are prohibitive from the cost standpoint. Five commercial alloys were discussed at some length: "Z" nickel, "K" monel, "S" monel, Inconel X, and Ni Span C. These alloys are characterized by excellent corrosion resistance, good strength and toughness, and moderately high endurance limit. Because of their ability to harden independently of section size, they avoid the limitation of restricted hardenability which is present in most alloy steels.

Mr. Carson focused his attention on beryllium copper. Although there is a wide variety of age hardening copper alloys, the response to age hardening is small with all but the beryllium alloy. The development of beryllium copper has been rapid during and since the war. Three of these alloys are now available: a low-beryllium, high-cobalt alloy, and two high-beryllium and low-cobalt alloys.

These alloys respond to heat treatment with large changes in tensile strength, hardness, conductivity, elongation, modulus, endurance and stability. It is interesting to note that beryllium copper is one of the very few metals whose modulus of elasticity can be appreciably affected by heat treatment. Mr. Carson discussed the effect of added cold work, hardening temperature and time on important physical properties of each of the three alloys, and showed how different combinations of strength, conductivity, ductility and stability can be obtained.

The 1.7% beryllium alloy in mill hardened form has high ductility with good hardness, which permits fabrication of the alloy in the heat treated condition, thus eliminating the hardening operation.

Recommended design stresses were given for each alloy for static load, endurance, stability and operation at elevated temperature. The talk was concluded with slides showing a variety of typical applications for each of the alloys.

J. A. Fellows Returns to American Brake Shoe

American Brake Shoe Co. has appointed JOHN A. FELLOWS assistant chief metallurgist at the company's research center in Mahwah, N. J. He is resuming his association with Brake Shoe after 2½ years' service in the atomic energy field and 1½ years' with Union Carbide and Carbon Corp.

J. A. Fellows

Dr. Fellows first started with the Brake Shoe company as assistant metallurgist in 1937. He attended Williams College and Massachusetts Institute of Technology, from which he received the degree of D. Sc. in 1942. He is a member of the American Institute of Mining and Metallurgical Engineers as well as the A.S.M. and has contributed technical papers to both organizations. In 1944 he was corecipient of the A.S.M. Howe Award.

Compliments

To ROBERT F. MEHL director of the Metals Research Laboratory and head of the department of metallurgical engineering at Carnegie Institute of Technology, on his appointment to the Committee for the Distribution of Radioisotopes of the Atomic Energy Commission.

To ANTHONY J. LANGHAMMER president of the Amplex Division of Chrysler Corp., on the award of a medal for outstanding achievement in the field of powder metallurgy, and the presentation of the annual medal lecture of Stevens Institute of Technology on "Industrial Application of the Powder Metallurgy Process". (This lecture is published in the March issue of *Metal Progress.*)

C. S. Gordon

To CLAUD S. GORDON, president and treasurer of the Claud S. Gordon Co., Chicago, on his appointment to the Small Business Advisory Committee for the U. S. Dept. of Commerce.

To B. H. LELONG, vice-president and technical director of Carpenter Steel Co., on the award of the Bradley Stoughton Plaque given annually by the Lehigh Valley Chapter A.S.M. to a local metallurgist who has accomplished outstanding and generally useful metallurgical work.

Large Turnout at York Honors President

A Large Group of Members and Guests Headed by President Francis B. Foley were present at the banquet and meeting of the York Chapter on "National President's Night" Jan. 14. Shown in the photograph, (left to right) are William F. Allen, chairman of the Entertainment Committee; Frank J. Allen, chairman of the Program Committee; President Foley; Chapter Chairman A. R. Kunkle; Secretary Ray Vines; and Treasurer Glenn Frank. Mr. Foley spoke on "Behavior of Metals Under Stress at High Temperatures" (Reported by A. J. Kleiner)

checkers, and removed, cleaned, and returned to service at higher operating temperatures, showed excessive bloating and shelling; checker bricks from openhearth checkers were affected in a similar manner. Chemical analyses indicated that pickup of excessive alkalis may be responsible.

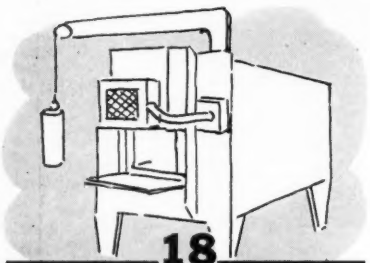
17-17. Experiments With Explosives for Opening Furnace Tap Holes. *Steel,* v. 122, Feb. 16, 1948, p. 107, 110.

Besides the paper referred to in the title, which was presented by John R. Barnes of Republic Steel, several other papers presented at annual winter meeting of Eastern States Blast Furnace and Coke Oven Association, Pittsburgh, Feb. 6, 1948, are reviewed. Subjects covered include blast-furnace lining disintegration, carbon hearths, and top and bottom burning of tuyeres.

17-18. Safer Blast Furnace Lining. *Business Week,* Feb. 14, 1948, p. 70-71.

Interlake Iron Corp. installs new type of carbon-block hearth that prevents molten metal from eating through furnace. It is also faster to install, permits better insulation against heat loss.

For additional annotations indexed in other sections, see:
13-8; 16b-7-14; 18b-13.



18 HEAT TREATMENT

18a—General

18a-2. Salt Descaling Baths. Horace Drever. *Industrial Heating,* v. 15, Jan. 1948, p. 40, 42, 44, 46, 48, 50, 52, 166, 168.

Two types serve to illustrate the significant differences between all processes. These are the sodium hydride and the sodium hydroxide processes. The methods are useful for both ferrous and nonferrous metals.

18a-3. Control of Heat Treatment—I. A. H. Koch. *Industrial Heating,* v. 15, Jan. 1948, p. 66, 68, 70, 72, 74, 113.

Developments in heat treating and metallurgy which resulted in present processes; methods, types, limitations, and accomplishments of temperature control; importance of control of time. Five types of furnaces described. (To be continued.)

18a-4. Heat Treating During 1947. Arthur R. Elsea. *Metals Review,* v. 21, Jan. 1948, p. 5, 7, 9, 11.

Reviews progress in fundamentals as reflected in the current literature. Homogenization; austenite decomposition; tempering and mechanical properties; carburization; controlled atmospheres.

18a-5. Products and Processes for Heat Treating. *Metals Review,* v. 21, Jan. 1948, p. 13, 15, 17.

An index to new equipment developed or improved during the past 12 months. Electric and gas-fired furnaces; carburizing and cyaniding; gas atmospheres and generators; salt baths; induction heating; burners, valves, fuel generators; high-alloy furnace parts; refractories and insulation; miscellaneous accessories.

18a-6. Bright Hardening and Tempering Tiny Parts—I. Harry L. Hovis and A. W. Marks. *American Machinist,* v. 92, Feb. 12, 1948, p. 91-94.

Operations on items such as precision watch or instrument parts, where decarburization, carburization or oxidation is not permitted. (To be continued.)

18b—Ferrous

18b-4. Cyclic Annealing of Steel Forgings Saves Time, Betters Quality. Kenneth Rose. *Materials & Methods,* v. 27, Jan. 1948, p. 71-74.

Use of close control over time and temperature in annealing of steel forgings with resulting speedup of the entire process.

18b-5. Application of the TTT-Curves in Heat Treating by Induction. Howard E. Boyer. *Steel Processing,* v. 34, Jan. 1948, p. 29-35.

Details as applied to various steel compositions.

18b-6. The Stainless Steels—Hardening and Annealing of the Low, Medium and High-Carbon Steels. Lester F. Spencer. *Steel Processing,* v. 34, Jan. 1948, p. 36-40, 51.

Recommended procedures. Microstructures resulting from various treatments. (To be continued.)

18b-7. Principles of Modern Heat Treating. R. M. Dyke. *Steel,* v. 122, Jan. 26, 1948, p. 55-60, 62, 64.

Growing importance of understanding exactly what happens within steels during heat treatment is emphasized as more complicated alloys and new operations are introduced. A discussion of fundamentals.

18b-8. Large Car-Type Furnaces Featured at Pearson Industrial Steel Treating Co. *Industrial Heating,* v. 15, Jan. 1948, p. 128, 130, 132, 134.

Equipment and procedures. (To be continued.)

18b-9. Induction Hardening Cast Iron. *Iron Age,* v. 161, Jan. 29, 1948, p. 76. Condensed from "Some Factors Affecting the Induction Hardening of an Alloy Cast Iron", by J. R. Sloan and R. H. Hays.

Previously abstracted from Preprint No. 5, American Society for Metals. See 18-172, R.M.L., v. 4, 1947 *(Metals Review,* Sept. 1947).

18b-10. The Mechanical Properties of a Nickel-Chromium-Molybdenum Steel Obtained by Stepped Quenching. G. Delbart and R. Potaszkin. *Journal of the Iron and Steel Institute,* v. 157, Dec. 1947, p. 527-535.

Compares the mechanical properties of a Ni-Cr-Mo steel after stepped quenching with those obtained after air cooling or oil quenching followed by tempering. The influence of temperature of the intermediate quenching bath and of tempering temperature on mechanical properties was studied, and the results were plotted against tensile strength. Best results were obtained with martensitic quenched structures obtained by direct oil quenching or air cooling, and also by stepped quenching with intermediate holding at 200° C. or between 400 and 600° C. for the range of tensile strength between 90 and 110 kg. per sq. mm. Similar results can be obtained by holding in the bainitic region and tempering.

18b-11. The Evolution and Absorption of Hydrogen by Steel in Industrial Reheating Furnaces. J. Cameron. *Journal of the Iron and Steel Institute,* v. 157, Dec. 1947, p. 609-615.

The influence of reheating-furnace atmospheres on the hydrogen content of steel ingots is discussed from the theoretical standpoint. The hydrogen content of furnace atmospheres is calculated for a variety of fuels and it is shown to be negligible for all practical conditions of humidity and combustion. Local concentrations of hydrogen caused by the action of water vapor on iron are not likely to exceed 2%. Atmospheric hydrogen content has practically no effect on the ingot hydrogen content.

18b-12. Use of Subzero Temperatures for Treating and Assembling Metal Parts. *Machinery* (London), v. 72, Jan. 8, 1948, p. 43-45.

Use in achieving dimensional stability; in shrink-fit assembly processes; in air cooling of metal-cutting tools; and in subzero hardening of steels.

18b-13. Annealing Ovens; Equipment and Practice for Malleable Iron. James H. Lansing. *American Foundryman,* v. 13, Jan. 1948, p. 38-40.

The various types; insulating and refractory materials; annealing schedules.

18b-14. Flame Hardening Machine Tool Parts. W. D. Whalen. *Welding Journal,* v. 27, Jan. 1948, p. 11-18.

Basic methods of spot hardening, spinning, progressive, and combination flame hardening. (Presented at 47th Annual Convention of International Acetylene Assoc., Cincinnati, May 20-21, 1947.)

18b-15. Cyclic Annealing Alloy Steel Forgings. *Steel,* v. 122, Feb. 9, 1948, p. 99.

Process is said to produce highly machinable metal structures in a few minutes.

18b-16. Fundamentals of Annealing Low-Carbon Steel. Part II. G. Sachs, L. J. Ebert, A. W. Dana, and M. H. Jones. *Iron and Steel Engineer,* v. 25, Jan. 1948, p. 98-100.

Supplements results of experiments previously described in *Proceedings of the AISE,* 1946. In the previous paper, yield strength and elongation were chosen as major criteria. Charts were constructed which showed relationships between annealing time and temperature as it affects these properties. Application of the data to commercial problems showed the need for similar plots for hardness and grain size, which are herewith presented.

18b-17. Scale; A Discussion of Data on Oxidation. W. Trinks. *Iron and Steel,* v. 21, Jan. 1948, p. 35-36. Reprinted from *Industrial Heating,* v. 14, Oct. 1947, p. 1601-1602, 1604.

See item 18-227, R.M.L., v. 4, 1947.

18b-18. Symposium on the Peeling of White-Heart Cast Iron; Introduction. J. C. W. Humfrey. *Journal of the Iron and Steel Institute,* v. 158, Jan. 1948, p. 1-2.

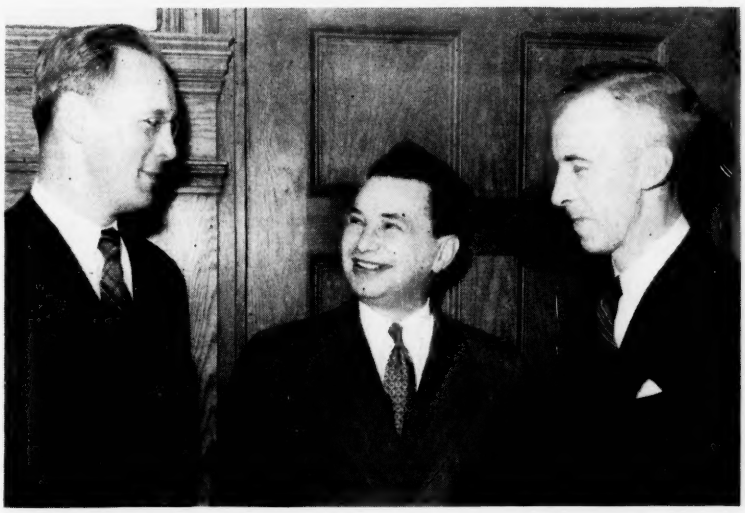
The occurrence of the defect known as "peel" in white-heart malleable castings reached serious proportions during the last war, through the failure of track links in military vehicles. The four papers of the symposium record the incidence of this defect and show how its causes and the means of elimination were discovered.

18b-19. The Formation of Peel on White-Heart Malleable Cast Iron. A. Preece and K. J. Irvine. *Journal of the Iron and Steel Institute,* v. 158, Jan. 1948, p. 3-8.

Studied by exposing suitable specimens to mixtures of CO, CO_2, and SO_2. It was found that the essential conditions are the presence of sulphur in the gases and a high CO content. The oxide network associated with peel formation is caused by preferential oxidation of Si. In a sufficiently reducing atmosphere,

(Turn to page 40)

Gives Laymen's Talk on Heat Treatment



Peter Payson, Assistant Director of Research, Crucible Steel Co. (Center), Gave a Layman's Talk on Heat Treatment Before the Worcester Chapter at a Recent Meeting. Left is J. Walter Gulliksen, technical chairman; and at right is Lloyd G. Field, chapter chairman

Reported by Stephen M. Jablonski
Metallurgist, Wyman-Gordon Co.

"The purpose of heat treatment," Peter Payson of Crucible Steel Co. of America told the Worcester Chapter A.S.M. in December, "is to induce one or more properties not already present in the material." This, he explained, is accomplished by controlling the degree of heating and rate of cooling.

Mr. Payson reduced his talk on "Basic Principles of Heat Treatment" to fundamentals understandable to the layman, and eliminated as far as possible the technical terminology and jargon of the metallurgist. Formation of austenite, with solution of carbides containing such elements as tungsten, molybdenum, chromium and vanadium—and the subsequent transformation of this austenite—were explained.

These effects were illustrated by Mr. Payson on three steels, namely, high speed steel, 1.05% carbon tool steel, and medium alloy S.A.E. 4340 steel. TTT-curves or "one-way maps" were used to trace microstructures resulting from a given heat treatment and their influence on properties. Hardening, cycle annealing, furnace annealing, martempering, austempering, and tempering were described. Requirements of temperature, time, and cooling for each of these heat treatments were discussed for the three steels used as examples.

Cowles Appoints Distributor

Cowles Detergent Co., Cleveland, has appointed the Sessions-Gifford Co., Inc., of Providence, R. I., and Boston, as distributors of the Cowles line of alkaline and emulsion solvent-type metal cleaners in the New England states.

Trends in Modern Sleeve Bearings Traced at Louisville

Reported by G. W. Birdsall
Manager, Technical Editorial Service Reynolds Metals Co.

"The earliest bearing used by man was a thrust bearing consisting of a piece of stone to apply force on a stick used to drill holes," said J. F. Cernes, supervisor of metallurgical research laboratories for Cleveland Graphite Bronze Co., in introducing his talk on "Manufacture and Performance of Sleeve Bearings" before the Louisville Chapter on Feb. 3. "The sleeve bearing surface first appeared with the invention of the wheel about 5000 years ago."

There was little incentive to develop bearing metals until heat engines were put to work in the 19th century, Mr. Cernes continued. With the high loads encountered, bearing development was fairly rapid. Isaac Babbitt introduced insert bearings consisting of steel or bronze backs lined with tin-base alloy which has become known as babbitt metal.

Modern sleeve bearings for low loads consist of a tin or lead-base liner on a steel back. The tin and lead-base alloys serve quite well since they have good surface properties, are resistant to corrosion, and do not score unhardened shafts. Cadmium-base alloys are used in similar applications but are somewhat more susceptible to corrosion.

For more severe duty, the copper-lead alloys, and the more recently introduced aluminum-tin alloys, are used. The copper-leads do not have the desirable surface characteristics of the tin and lead-base alloys and require higher shaft hardness. They do, however, have greater mechanical strength and resistance to fatigue failure. The plated silver bearing with a thin overlay of lead-indium was fully developed during the last war and served excellently in the most critical applications where severe duty was encountered.

The trend today for heavy-duty bearings is toward cast copper-lead bearing material on a steel back with a plated lead or tin-base overlay about 0.001 in. thick. The plated overlay constitutes the bearing surface and the copper-lead serves as the bearing surface in the event that the overlay is destroyed or worn.

18,000-Ton Forging Press Is Country's Largest Equipment

Reported by Melvin R. Meyerson
National Bureau of Standards (Washington Chapter)

and John W. Watson
Metallurgist, Link-Belt Co. (Indianapolis Chapter)

A huge forging press—probably the largest single piece of equipment in America—was described before the Washington and Indianapolis Chapters A.S.M. on Jan. 12 and 19 respectively. A. J. Pepin, assistant to the vice-president, Wyman-Gordon Co., told how this 18,000-ton hydraulic monster was planned, built and used.

In the development of jet engines for aircraft during the war, the need for larger light metal alloy forgings of maximum properties became acute. At the time, England and Russia as well as Germany had equipment more suitable for this purpose than did the United States. Our heaviest presses of 10,000 to 14,000 tons capacity, used in the cogging of ingots and forging of heavy armor plate, were not designed for nor accurate enough for the use intended.

While postwar investigation has turned up a 30,000-ton press in Germany, the 18,000-ton press is the largest in this country. It has an over-all length of stroke of 5 ft. and a length of pressing stroke at full power of 18 in., which is much greater that that of the German machine.

Many problems have been encountered in using this press, such as the availability of sufficiently large wrought stock (up to 18 and 20-in. rounds). At present, cast stock is used; it is improved considerably by "kneading" in the three dimensions of the cube. More time is consumed in cross-working cast stock than in actual forging.

Dies used in forming magnesium are heated as high as 650° F. The largest magnesium alloy forging ever made weighed over 375 lb. More than 13,000 lb. of magnesium can be heated for forging in 1 hr.

A full color motion picture and black and white slides illustrated the installation of the press and its operation.

absorption and diffusion of sulphur take place, forming a continuous band of iron sulphide beneath the surface of the iron. The depth of this band is directly related to the amount of surface decarburization.

18b-20. Peel on White-Heart Malleable Cast Iron. J. S. Bowden. *Journal of the Iron and Steel Institute,* v. 158, Jan. 1948, p. 9-14.

Development of tests to detect peel on track links and on other castings which are to be used without machining. Experiments devised to determine conditions under which peeling takes place. A theory is advanced that peel formation occurs by preferential oxidation of the silicon in the metal to form fayalite when the $CO:CO_2$ ratio in the malleableizing atmosphere is abnormally high. It is also demonstrated that peel can be produced on Si-Mn steel.

18b-21. Peeling of White-Heart Malleable Iron. G. R. Webster and A. E. Probst. *Journal of the Iron and Steel Institute,* v. 158, Jan. 1948, p. 15-19.

Peeling, as distinct from scaling. Examples of the defect. Experiments with malleable iron of varying thicknesses and with various sulphur contents have shown that a high sulphur content in the iron ore used for malleableizing causes peeling.

18b-22. Experimental Work Carried Out at the British Cast Iron Research Association. J. Bernstein. *Journal of the Iron and Steel Institute,* v. 158, Jan. 1948, p. 20-36.

Characteristic microstructure of peeled samples of white-heart malleable cast iron. The prime cause of peeling is the inward penetration of sulphur from the annealing ore or from sulphur-containing gases in the annealing atmosphere. Factors affecting depth of the peeled layer are enumerated. Peeling is demonstrated to be a complex phenomenon involving decarburization, sulphurization, and inward penetration of oxygen; desulphurization may also occur. The diffusion processes involved are discussed. 10 ref.

18b-23. Recuit Rapide des Fontes Malléables. (Rapid Annealing of Malleable Cast Irons.) Gabriel Joly. *Fonderie,* Oct. 1947, p. 857-860.

Disadvantages of the ordinary French annealing furnaces for malleable cast iron; and suggestions for design changes and changes in composition of the irons.

18d—Light Metals

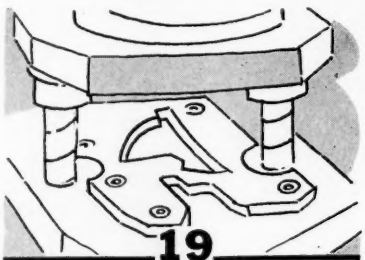
18d-1. The Use of the Jominy Test in Studying Commercial Age Hardening Aluminum Alloys. Blake M. Loring, William H. Baer, and George M. Carlton. *Metals Technology,* v. 15, Feb. 1948, T. P. 2337, 9 pages.

It was found that the modified L-type Jominy specimen offers a convenient means for investigating effects of cooling rate on age-hardening phenomena which is important for alloys to be used in heavy sections. An apparent critical rate of quenching was noted in all of the alloys investigated. With the exception of the 75 S-T alloy, the widely different rates of cooling used had little effect on the hardness attained on aging.

18d-2. Heat Treatment of Aluminum Alloy Die Castings. R. A. Quadt. *Die Castings,* v. 6, Feb. 1948, p. 36-42.

Improvement in mechanical properties by solution treating and aging. Expansion of gas entrapped during casting is probable cause of pimpling and distortion on solution treating. Recommendations for proper gating to minimize air inclusions. (To be continued.)

For additional annotations indexed in other sections, see: 11-31; 16b-9-17; 19d-12; 22b-53; 27a-25.



19 WORKING

19a—General

19a-11. Forging Die Design; the Bulldozer. John Mueller. *Steel Processing,* v. 34, Jan. 1948, p. 17-19, 35.

The "bulldozer" is a metal-forming machine, designed for bending and forming, and particularly adapted to making deep bends, because of the long stroke and accessible die space. Equipment and procedures for its use on various types of work.

19a-12. Lubricant in Deep Drawing. A. H. Stuart. *Light Metals,* v. 11, Jan. 1948, p. 45-48.

The mechanics and physics of various media employed in commercial practice, with special reference to the virtues of colloidal graphite.

19a-13. Regulator Bodies and Caps Can Be Made Out of Bar Stock; But the Modern Die Forging Is Vastly Superior. *Weld,* v. 4, Jan. 1948, p. 17.

Refers to regulators for compressed gases, such as those used in welding.

19a-14. Die-Less Duplicating—a New Technique for the Sheet Metal Worker. G. H. Danielson. *Sheet Metal Worker,* v. 39, Jan. 1948, p. 96-98.

Use of simple hand-operated machines known as "Di-Acro" for bending, notching, forming, perforating, shearing, slitting. Said to be of especial value to the small job shop.

19a-15. Difficult Forming Problems Solved With the Metal Stretching and Shrinking Machine. R. Smith. *Sheet Metal Industries,* v. 25, Jan. 1948, p. 131-134, 142.

Machine developed in the U. S. and its applications.

19a-16. Berechnung der Beim Walzen Auftretenden Kräfte und der Walzarbeit im Lichte der Versuchsergebnisse. (Calculation of the Forces Occurring During Rolling and the Effect of Rolling in the Light of Experimental Data). A. Geleji. *Schweizer Archiv,* v. 13, Nov. 1947, p. 336-344.

Formulas for the simplest case where side pressures do not interfere and where square bars are rolled.

19a-17. The Extursion Molding Process. H. B. Cook. *Iron Age,* v. 161, Jan. 29, 1948, p. 62-69; Feb. 5, 1948, p. 79-86, 134. Based on research records of Charles C. Misfeldt.

Particular emphasis on development and application of process, and its potentialities as a production medium for gas-turbine parts. Various other metal-shaping techniques compared with extrusion molding. Interesting possibilities of Be-Ni-Cu alloys, extrusion molded, for high-temperature service, and the desirability of more extensive use of proportional limit values for design purposes. How use of heat resistant materials establishes limitations on operating temperatures of jet engines which restrict their power efficiency. Construction and operation of an extrusion molding machine.

19a-18. Manufacture of Diamond Tools and Their Application in Germany. (Continued.) *Industrial Diamond Review,* v. 8, Jan. 1948, p. 7-15. Reprinted from B.I.O.S. Report No. 1448, **The German Industrial Diamond Industry,** by G. J. Trapp, R. P. Eccles, P. Grodzinski, H. E. Jones, R. E. Leeds, N. Robinson, N. R. Smith, and D. B. Vallance.

Diamond truing tools, and reports on procedures of various wire-drawing works. Dental tools and diamond powder. 19 ref. (To be continued.)

19a-19. Designing of "Trouble-Free" Dies. Part LXXVII. Modern Trends in Safety First Appliances. C. W. Hinman. *Modern Industrial Press,* v. 10, Jan. 1948, p. 22, 40.

Safety guards of various types, for use on power presses.

19a-20. Jobber Can Serve Metalworking Needs of Many Industries. Walter Rudolph. *Modern Industrial Press,* v. 10, Jan. 1948, p. 28, 32, 34.

Metal-forming and welding equipment and procedures used at Wm. J. Meyer Co., Rochester, N. Y., a typical job shop.

19a-21. Metal Spinning of Sheet Products. Italo Adamis. *Western Machinery and Steel World,* v. 39, Jan. 1948, p. 70-73.

19a-22. Press Work. *Western Machinery and Steel World,* v. 39, Jan. 1948, p. 81.

Manufacture of price-tag holder.

19a-23. Future Trends in Machinery and Dies for the Wire Trade. N. Davidson. *Wire Industry,* v. 15, Jan. 1948, p. 37-41.

19a-24. The Practical Aspects of Metal Spinning. Robert J. Schneider. *Iron Age,* v. 161, Feb. 12, 1948, p. 76-80, 133-134.

The advantages and limitations of spinning, and where the technique can be most profitably applied. Metals which can be spun, spinning techniques and equipment, tolerances, control of dimensions, flow of the metal, and design considerations.

19a-25. Forming Metal Shapes by Cold Rolling. E. J. Vanderploeg. *Machinery* v. 54, Feb. 1948, p. 153-158.

Types and construction of roll forming machines and accessory equipment required for the fabrication of various shapes. (First of a series.)

19a-26. Die Set Problem Solved. Edward Diskavich. *Production Engineering & Management,* v. 21, Feb. 1948, p. 75.

A production problem encountered in connection with punching small holes in metal was solved by processing the die set diagrammed, by an uncommon method.

19a-27. Procedures for Drawing Flanged Shells. James Walker. *Tool Engineer,* v. 19, Jan. 1948, p. 37-42.

Concluding of a series on drawing die problems and formulas.

19a-28. Practical Problems of Light Presswork Production. (Continued). J. A. Grainger. *Sheet Metal Industries,* v. 25, Jan. 1948, p. 99-102.

Various types of power shears. (To be continued.)

19a-29. The Production of a U-Shaped Component From Thin Strip. V. Sutton. *Machinery* (London), v. 72, Jan. 22, 1948, p. 107.

Simple press tool.

(Turn to page 42)

Slag Control Promotes Economy of Operation and High Production Rates

Reported by Hans J. Heine
Plant Metallurgist
Pittsburgh Equitable Meter Division
Rockwell Mfg. Co.

Tonnage of iron for a typical blast furnace has decreased from 850 to 700 tons per day during the past two years, Karl L. Fetters, special metallurgical engineer, Youngstown Sheet and Tube Co., warned the members of the Pittsburgh Chapter A.S.M. on Jan. 8. This has been brought about by an increase in ash content of the fuel and a concomitant decrease in coke quality, as well as by a decrease in density of the scrap.

Speaking on "Slag Control in the Economics of Steel Production", Dr. Fetters presented a summary of the chemistry, mineralogy, control and operating significance of basic openhearth slags, placing special emphasis on optimum conditions for economy and high production rates.

A layer of slag covers the molten metal, and the ingoing heat must penetrate the layer, Dr. Fetters explained. Without good control a low slag volume is impossible to obtain. Savings in heat time and an increase in the R value (tons per hour divided by the total tonnage per heat) can be achieved by proper slag control.

Dr. Fetters next considered the basicity of the slag as a function of the amount of lime in solution. The amounts of fluxing agent are important in controlling the degree of basicity. An increase in the basicity—by increase of the slag volume—reduces the production rate of the openhearth furnace.

An important problem is the reduction of sulphur, and the higher the slag volume the lower the sulphur content will be. It is common practice to charge a deficiency of lime and make the necessary corrections later.

Slags Classified by Type

Studies in mineralogy, Dr. Fetters said, and an intelligent application of physical chemistry principles are useful in the investigation of slags. Slags can be classified by type and "maturity" (i.e., degree of solution). The major constituents of a basic slag are CaO, SiO_2, MnO, MgO, and FeO. P_2O_5 may be present.

The usefulness of temperature-composition diagrams was illustrated by explaining the ternary SiO_2-CaO-FeO system. Its major mineral constituents are cristobalite, tridymite, wollastonite and fayalite. (While the first two are mineral forms of silica, wollastonite is $CaO{\cdot}SiO_2$ and fayalite $2FeO{\cdot}SiO_2$.)

Dr. Fetters explained the lime to silica ratio, known as V, expressed by

$$\frac{CaO}{SiO_2 - P_2O_5}$$

Some openhearth slags contain only a single phase, others two, some three. Acid slags, whose V value is less than 1.6, are typical of premelt or early melt slags. There is no evidence of phases which have not been in solution, and the silicate phase predominates.

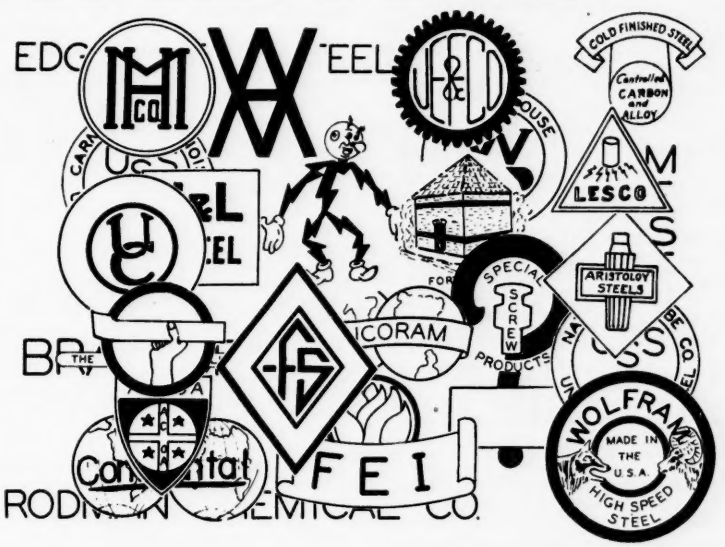
When the V ratio exceeds the value of 1.6, dicalcium silicate begins to form and undissolved phases start to appear. As the V ratio approaches 2.0, the solubility is much decreased unless the temperature is kept quite high. A judicious use of fluorspar aids in solution. The V ratio will be slightly in excess of 2.0 for typical finishing slags.

As the basicity increases, tricalcium silicate exists instead of dicalcium silicate. As would be expected, larger grains of the slag form as the rate of cooling decreases. Electric furnace slags seem to crystallize with larger grain size than openhearth slags.

Marshall Leads Discussion

During the extensive discussion, which was led by Shadburn Marshall, development engineer of Carnegie-Illinois Steel Corp., Dr. Fetters touched upon the oxidizing power of some slags and mentioned that the rate of oxygen transfer may very over wide limits. The practice of bubbling oxygen through the bath (direct oxidation) has passed the experimental stage but does not make slag control superfluous.

In closing, Dr. Fetters made the thought-provoking suggestion that experiments should be carried out in an effort to take the burden of sulphur elimination from both the blast furnace operator and the openhearth shop by eliminating sulphur while the metal is in transfer. While the metallurgical know-how is already available, translation into practice has been wanting until now.



Identification of Trade Marks of All of the Sustaining Members of the Pittsburgh Chapter Formed an Interesting Little Quiz Program Preceding the Featured Lecture by Dr. Fetters. New sustaining members were awarded plaques and certificates in appreciation for their support

Wm. Price Retires After 45 Years With Scovill

WILLIAM B. PRICE, one of the brass industry's pioneer metallurgists, retired as director of research at the Scovill Mfg. Co., Waterbury, Conn. on Jan. 1, 1948. Mr. Price has been associated with the company since his graduation from Sheffield Scientific School, Yale University in 1902.

Mr. Price has made major contributions to the metallurgical advancement of the nonferrous metal industry during his 45 year career with Scovill and he has been granted many patents on copper-base alloys with new or improved physical and chemical properties. He has participated in the work of important committees of many scientific societies, and has served some of them in varied executive capacities. In addition, he has been a member of the Nonferrous Metallurgical Advisory Board of the Frankford Arsenal, and in 1932, was elected an alumni member of the Yale Chapter of Sigma Xi.

Mr. Price's book on the "Technical Analysis of Brass", first published in 1911, has been widely used as a metallurgical guide in the general nonferrous field.

He will be succeeded by F. M. BARRY, an associate of Mr. Price since 1917.

19a-30. Die for Forming Clip. L. Kasper. *Machinery* (London), v. 72, Jan. 22, 1948, p. 119-120.
Described and diagrammed.

19b—Ferrous

19b-16. Crucible Modernizes Wire Mill. John Anthony. *Iron Age*, v. 161, Jan. 29, 1948, p. 70-73.
New straightline pickling unit, new annealing furnaces, continuous coil-grinding equipment and a number of high-speed draw benches at Sanderson-Halcomb works of Crucible Steel Co. of America.

19b-17. Drawing Special Types of Industrial Wire. *Steel*, v. 122, Feb. 2, 1948, p. 98-100, 114.
Methods and equipment used by Keystone Steel & Wire Co. in drawing steel wire for miscellaneous industrial purposes.

19b-18. "Ragging" 40-in. Blooming Mill Rolls. *Steel*, v. 122, Feb. 2, 1948, p. 108.
Grooving or "Ragging" 40-in. blooming-mill rolls on a new roll-rotating machine.

19b-19. A Thoroughly Modern Pressroom Makes the Thoroughly Modern Jeep. P. D. Aird. *Modern Industrial Press*, v. 10, Jan. 1948, p. 13-14, 18-19, 40.
Pressing, stamping, shearing, bending, and welding operations.

19b-20. School Bus Body Manufacturer Modernizes Plant With Presses and New Bath Contour Former. Floyd McKnight. *Modern Industrial Press*, v. 10, Jan. 1948, p. 24-26.
Procedures and equipment at Oneida Products Corp., Canastota, N. Y. The frame parts are shaped on a "Universal" contour former, product of Cyril Bath Co., Cleveland.

19b-21. Unusual Presswork Involved at Modern Fabricating Plant of Eaton Metal Products. Gerald E. Stedman. *Modern Industrial Press*, v. 10, Jan. 1948, p. 36, 38, 40.
Procedures and equipment for production of truck, stock, oil, pressure, butane and propane, water-softener, and special-purpose tanks in a wide range of diameters up to 30 ft.

19b-22. Pilger Mills; A General Review of the German Steel Tube Industry. (Concluded.) J. C. Eck and A. E. V. Sparrow. *Iron and Steel*, v. 21, Jan. 1948, p. 33-35. Based on B.I.O.S. Report 3187.

19b-23. Electric Motors Over 300 Hp. Applied to Main Roll Drives in the Iron and Steel and Allied Industries During 1947. *Iron and Steel Engineer*, v. 25, Jan. 1948, p. 69-71.
A tabulation.

19b-24. Punching Narrow Slots in Heavy Plate. *Machinery*, v. 54, Feb. 1948, p. 180.
Recommended procedure for punching rectangular slots in annealed mild-steel plates $\frac{5}{8}$ in. thick. The slots are $\frac{1}{2}$ in. wide by 2 in. long, and are staggered with about $\frac{3}{8}$ in. of metal between them vertically and $\frac{3}{4}$ in. horizontally.

19b-25. Deep Drawing Washer Tubs With Less Than 1% Loss. *Ceramic Industry*, v. 52, Feb. 1948, p. 47-48.
Use of deep drawing in fabrication of washing-machine tubs.

19c—Nonferrous

19c-5. Effect of Processing Variables on Stress Required in Drawing Tubular Brass Parts. George Espey and George Sachs. *Steel*, v. 122, Feb. 16, 1948, p. 82-84, 114, 116.
Results of research at Case Institute of Technology, sponsored by Frankford Arsenal. Variations in tube dimensions, contour and finish of die and punch, temper and surface condition of tubular parts, and lubricant.

19c-6. Wire, Machines and Processes Mean Better Cold Headed Brass. Walter D. France. *American Machinist*, v. 92, Feb. 12, 1948, p. 96-97.
Changes in design put more importance on composition, microstructure, temper, and surface of material for best production.

19c-7. Structure d'Emboutissage des Metaux Usuels. (Structure Resulting From Stamping of Ordinary Metals.) Parts II and III. J. Tennevin and R. Michand. *Metaux et Corrosion*, v. 22, Aug. 1947, p. 130-138; Sept. 1947, p. 142-145.
Part II covers spherical and cylindrical stamping dies, and their effects on metallic structure of aluminum and brass. Conclusion discusses conical stamping and effects on aluminum of different impurities. The value of X-rays in making this study is stressed and its application to the study of other industrial problems is urged. 11 ref.

19d—Light Metals

19d-6. Rolling Aids. *Light Metals*, v. 11, Jan. 1948, p. 43-45. Translated and condensed from article by Hemmerich, *Werkstatt und Betrieb*, v. 80, 1947, p. 192.
Devices to facilitate handling of aluminum sheet during rolling.

19d-7. Drawing Dies for Magnesium. Installment No. 9. James Walker. *Tool Engineer*, v. 19, Jan. 1948, p. 31-35.
Numerous diagrams showing design.

19d-8. Light Alloy Forgings; Methods Employed by German Technicians. *Metal Industry*, v. 72, Jan. 23, 1948, p. 72-73. Condensed from a recent B.I.O.S. report.

19d-9. Drawing Aluminum Tubing. Chas. T. Flachbarth. *Modern Metals*, v. 3, Jan. 1948, p. 20-21.
Types of drawing; working characteristics; control; and fields of application.

19d-10. Spinning and Panel-Beating of Aluminum Alloys. Part III. (Concluded). E. R. Yarham. *Modern Machine Shop*, v. 20, Feb. 1948, p. 132-134, 136, 138, 140, 142, 144, 146, 148, 150.
British tools and methods for hammering aluminum alloys.

19d-11. The German 30,000-Ton Light Metals Forge Press. G. S. Simpson, Jr. *Technical Data Digest*, v. 13, Feb. 15, 1948, p. 7-16.
Press was operated in Bitterfeld, Germany, by the I. G., from 1944 to 1945. Its history, and operation, application, and production factors.

19d-12. Works Practice in the Rolling and Extrusion of Aluminum at the Rogerstone Works of the Northern Aluminum Co., Ltd. Alastair McLeod. *Sheet Metal Industries*, v. 25, Jan. 1948, p. 73-91.
Extensive details of layout, methods, and equipment. Includes a description of annealing and heat treating procedures. (To be continued.)

For additional annotations indexed in other sections, see:
4c-13; 6d-2; 12a-13-16; 17-4; 23b-11; 23c-13; 24a-33; 24b-17.

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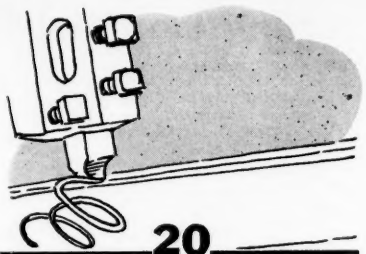

20
MACHINING and MACHINABILITY

20a—General

20a-43. Accuracy Improved and Costs Cut on Diverse Operations. Harold York. *Production Engineering & Management*, v. 21, Jan. 1948, p. 51-52.
Use of cemented carbide bars in precision boring of holes having a relative length of eight times the hole diameter.

20a-44. Correcting the Angle for V-Shaped Cutting Tools. Charles L. Hall. *Production Engineering & Management*, v. 21, Jan. 1948, p. 53.
A formula for determining the grinding-wheel dressing angle which will maintain the correct angle on V-shaped cutting tools upon repeated sharpening.

20a-45. Block Line Efficiency Boosted by Improved Machine Tools. *Production Engineering & Management*, v. 21, Jan. 1948, p. 55-61.
Various production operations at Hudson Motor Car Co.

20a-46. Universal Drill Jig. Edward J. Carey. *Production Engineering & Management*, v. 21, Jan. 1948, p. 65.
Drill jig with broad application to drilling and pinning operations on small shafts which have hubs of various size and diameters.

20a-47. The Economics of Broaching. W. A. Carter. *Aircraft Production*, v. 10, Jan. 1948, p. 19-23.
Some practical considerations in the use of surface and internal broaching as a production process. (To be continued.)

20a-48. Milling With the Slotting Attachment. Lawrence O. Dirk. *Screw Machine Engineering*, v. 9, Jan. 1948, p. 38-42.

20a-49. Screw Machine Engineering Data Sheet; Circular Forming Tool Holders. *Screw Machine Engineering*, v. 9, Jan. 1948, p.53.
Dimensions tabulated.

20a-50. Gage for Measuring Milling Cutter Angles. B. A. Kurenkov. *Engineers' Digest* (American Edition), v. 4, Dec. 1947, p. 588-589, Translated and abstracted from *Stanki i Instrument*, 1947, p. 18.

20a-51. American Machinist 35th Annual Review of Metalworking Equipment. *American Machinist*, v. 92, Jan. 29, 1948, p. 127-294.
More than 1500 new products of interest to the metalworking industries.

20a-52. Wheels for Grinding Tools—Broaches, Cutters, Reamers and Taps. *American Machinist*, v. 92, Jan. 29, 1948, p. 297.
Tables of standard sizes and bonds.

20a-53. Use Classification for Grinding Wheels. *American Machinist*, v. 92, Jan. 29, 1948, p. 299.
Standard shapes are diagrammed and numbered. Basic uses are listed with applicable wheel numbers alongside.

20a-54. Accurate Drilling Without a
(*Turn to page* 44)

Archer Discusses Problems Ahead in Steel Metallurgy

Reported by R. F. Thomson
International Nickel Co.

Speaking before a capacity crowd at the Jan. 12th meeting of the Detroit Chapter, R. S. Archer, vice-president of Climax Molybdenum Co. and a past president of A.S.M., discussed present and future problems facing the steel metallurgist.

Mr. Archer introduced his remarks by emphasizing the importance of properly evaluating the standards used in material testing. The metallurgist must be sure the test procedure and results obtained do not impose restrictions not encountered in the service structure. Mr. Archer then examined tensile, impact, fatigue and hardenability tests in the light of the useful data they present.

As we now look back, the time and effort spent in assembling tensile test data as a function of tempering temperature was largely wasted, for subsequent work has shown that the tensile properties of all quenched and tempered alloy steels are the same for a given hardness—subject to two restrictions: (*a*) The part must quench out fully hard to martensite; (*b*) the relation holds only up to 200,000 psi. tensile strength. Partially hardened steels show important variations from the above relationship, especially on yield strength and toughness.

There is no simple method for measuring severity of service. Testing partial or full-scale structures is an attempt in this direction. In the laboratory, the impact test at different temperatures is used to indicate the resistance of materials to varying induced severity of applied load.

Impact test data can be summarized generally by a chart in which energy of rupture decreases as the severity factor increases. Lowered temperature, higher loading rate, increasing transverse stress (sharper notches) all increase the severity factor. It should be borne in mind that high energy-of-rupture values are not required for all structures.

Mr. Archer then discussed some concepts of hardenability testing as viewed by European metallurgists. The difference in thinking of European and American metallurgists on the required amount of hardenability seems to be based largely on economic grounds. Americans use a steel with minimum hardenability as a consequence of mass production, which permits extensive study of the requirements of each part and close control. In Europe, production is smaller and a given heat of steel must make a variety of shapes and sizes. Thus, it is cheaper in the long run to select steels with excessive hardenability, which permits somewhat greater processing flexibility.

Some of the problems which lie ahead for the metallurgist are: (*a*) the effect on properties of incompletely hardened structures as a function of composition; (*b*) the determination of toughness of materials and the utility of transition temperatures versus actual service conditions; (*c*) the role of toughness in fatigue, especially at finite life where stresses are above the endurance limit; (*d*) proper control of prestress and correlation with certain metallurgical factors such as the role of strain aging in cold worked materials; also proper control of the magnitude and direction of stress during heat treatment; (*e*) effects of residual stress on fatigue; and (*f*) a simpler method for measuring surface stress.

Technical chairman for the evening was M. F. Garwood of Chrysler Corp., and the coffee talk was by S. L. A. Marshall, of the News.

Carbide Company Formed

A new company known as Eastern Carbide Corp. has been formed in New Rochelle, N. Y., to provide dies for wiredrawing, blanking, forming, coining, compacting and heading. Punches and heading hammers, as well as sharply engraved carbide sections, will also be supplied. Anthony J. Allen, formerly assistant products manager of Firth-Sterling Steel and Carbide Corp., McKeesport, Pa., is president of the new company, and Walter A. Ruppel, formerly assistant district manager of the carbide division of the mideastern district for Firth-Sterling, has been named as secretary-treasurer.

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RYERSON STEEL

Jig. Charles E. Lambert. *Tool Engineer*, v. 19, Jan. 1948, p. 30.

Simple tool devised for large-scale production of balance wheels.

20a-55. Centering Tool for Milling Cutters. D. E. McDonald. *Tool Engineer*, v. 19, Jan. 1948, p. 36.

Centering and offsets are quickly accomplished by means of simple device.

20a-56. Development of Economical Jig Grinding. Watson N. Nordquist. *Tool Engineer*, v. 19 Jan. 1948, p.37-38.

High-speed grinding attachment meets need for accurate conversion tool.

20a-57. Gadgets. *Tool Engineer*, v. 19, Jan. 1948, p. 42.

Drill Jig for Hex Tube, by Robert Mawson; Self-Aligning Back Rest, by Edmund L. Johnson.

20a-58. Compressed Air—the Great Equalizer. Vaners Borg. *Tool Engineer*, v. 19, Jan. 1948, p. 43-44.

Use of air tools in the small shop.

20a-59. Mechanism for Controlling Cutter-Head Slide of Cam-Generating Device. *Machinery* (London), v. 72, Jan. 1, 1948, p. 16-17.

20a-60. Grooving Tool for Oil Pump Body. *Machinery* (London), v. 72, Jan. 1, 1948, p. 17.

20a-61. Toolholder for Boring Bar. *Machinery* (London), v. 72, Jan. 1, 1948, p. 18-19. Translated from *Werkstatt & Betrieb*, v. 80, March 1947, p. 85-86.

20a-62. Hydraulic Control Mechanism for Profile Milling Machine. *Machinery* (London), v. 72, Jan. 8, 1948, p. 46-47. Based on F.I.A.T. Final Report No. 628.

Mechanism by which it is possible to obtain universal motion in 3 dimensions, enabling complicated internal and external forms to be reproduced to an accuracy of 0.0002 in.

20a-63. Accuracy and Diverse Operations Improved by Precision Boring With Rigid Solid Carbide Bars. *Steel*, v. 122, Feb. 9, 1948, p. 100.

20a-64. Machine Tools at Riverside. Gordon B. Ashmead. *Western Machinery and Steel World*, v. 39, Jan. 1948, p. 66-69, 98-100.

Procedures and equipment used at Food Machinery Corp., Riverside, Calif.

20a-65. West Tools Far East. *Western Machinery and Steel World*, v. 39, Jan. 1948, p. 78-80.

Machinery operation in production of large machinery for cement plants on the island of Taiwan.

20a-66. Grades of Carbides and Their Applications to Milling. *Western Machinery and Steel World*, v. 39, Jan. 1948, p. 82-84. Condensed from **Milling with Carbides**, a publication of the Milling Cutter Division of the Metal Cutting Tool Institute.

20a-67. You Can Use Cemented Carbide Tools Successfully. *Western Machinery and Steel World*, v. 39, Jan. 1948, p. 96, 110.

First of a series describing properties and applications.

20a-68. The Design and Construction of a 14-Ft. Gear Hobbing Machine. B. Barback. *Engineers' Digest* (American Edition), v. 5, Jan. 1948, p. 9-14. Condensed from paper No. 1091 of *Institution of Engineers and Shipbuilders in Scotland*, Oct. 1947, 31 pages.

20a-69. "Balanced" Production at Detroit Gear. Bartlett West. *Modern Machine Shop*, v. 20, Feb. 1948, p. 154-156, 158, 160, 162, 164, 166.

Shear-Speed hobbing and gear shaping; rack and underpress finishing methods at Detroit Gear Division of Borg-Warner Corp. which enable manufacturer to increase production on gears for truck transmission.

20a-70. Device for Checking Single Point Threading Tools. D. E. McDonald. *Modern Machine Shop*, v. 20, Feb. 1948, p. 180.

Use in checking the angle of tools.

20a-71. Adjustable Spindle Stop. Bert Charlesworth. *Modern Machine Shop*, v. 20, Feb. 1948, p. 184, 189.

Tool designed for facing-off ends of shafts to uniform accurate lengths.

20a-72. Milling Cams Without a Master or Layout. *Machinery*, v. 54, Feb. 1948, p. 178-179.

Disk cams for use on Brown & Sharpe No. 00, 0, and 2 automatic screw machines can be quickly and economically cut from special cast iron or mild steel blanks by means of the milling-machine attachment.

20a-73. Tool Engineering Ideas. *Machinery*, v. 54, Feb. 1948, p. 183-186.

Magnetic Holding Fixture Speeds Assembly Operation, by Herbert Weitz; Lathe Attachment for Chamfering Both Ends of Cylindrical Parts, by Mark W. Purser; and Indexing Fixture for Use in Machining Aluminum Containers, by Donald A. Baker.

20a-74. Cams; Their Production and Application. John E. Hyler. *Machine and Tool Blue Book*, v. 44, Feb. 1948, p. 143-146, 148, 150, 152.

Machine tools and methods.

20a-75. Generating Regular and Irregular Holes With a Gear Shaper. Douglas T. Hamilton. *Machine and Tool Blue Book*, v. 44, Feb. 1948, p. 155-156, 158, 160, 162, 164.

20a-76. How to Turn Nonstandard Threads. Ernest L. Schlage. *American Machinist*, v. 92, Feb. 12, 1948, p. 95.

20a-77. Shop Shots at Friden. *American Machinist*, v. 92, Feb. 12, 1948, p. 98-99.

Bevel-gear cutting, machining oscillating cams, multipress broaching, hypermilling carriage rails, grinding dials, and keytop painting.

20a-78. Practical Ideas. *American Machinist*, v. 92, Feb. 12, 1948, p. 129-134.

Offset boring head for taper turning with lathe (J. W. Rundt); tool for burring small inaccessible holes (Robert J. Chrosniak); fixture for spherical holes used as ball-and-socket joints (Clifford T. Bower); quick method for calculating gear changes not listed on gearbox plate (Wilton F. Hoag); gashing and hobbing of worn gears on engine lathe (Neil MacLeod); checking rotary table of surface grinder by use of two thin bars (S. Framurz); shaft-positioning device (H. Moore); cutting grooves in blind bore with special lathe tool (Allen MacNeal); and other miscellaneous shop hints.

20a-79. Methods for Mounting Cutters. *American Machinist*, v. 92, Feb. 12, 1948, p. 147.

20a-80. Job Planning on the Turret Lathe. Part I. E. L. Murray. *Tool Engineer*, v. 20, Feb. 1948, p. 17-25.

Fundamentals of turret-lathe practice; tooling principles; importance of the time element; scheduling of prior and succeeding operations; workholding devices; holding devices for second operations; bar-stock holding devices; maintaining close tolerances; principles of machining holes; special vs. standard tooling; production estimating; use of tables of machining rates; relations of available power. (To be concluded.)

20a-81. New Pantograph Simplifies Duplicating. Gunnar Skog. *Tool Engineer*, v. 20, Feb. 1948, p. 26.

New machine is said to feature the first basic improvement since 1825. This improvement is the Ratiobar, a device which, supported at either end by a rugged, yet delicately balanced, over-arm, aligns the pivot center, cutter spindle, and tracing stylus in an absolutely straight line. Another feature is that there is only one slider block to adjust for whatever reduction ratio is desired.

20a-82. Brown & Sharpe Introduces New Automatic. Karl Stad. *Tool Engineer*, v. 19, Jan. 1948, p. 44.

20a-83. A New Approach to the Problem of Automatic Size Control. Raymond T. Fenn. *Electrical Manufacturing*, v. 41, Feb. 1948, p. 106-110, 178, 180.

For either automatic diamond or plug sizing in an internal grinder, integrated control relays tie in rough and finish rates of hydraulic-wheel reciprocation with four motorized cross-feed rates, preselected through a novel system of variable-voltage control.

20a-84. Clearance Table for Cutter Grinding. *Production Engineering & Management*, v. 21, Feb. 1948, p. 73.

20a-85. The Economics of Broaching. Part II. Chip Control; Work Materials; Broach Assemblies; Fixtures. W. A. Carter. *Aircraft Production*, v. 10, Feb. 1948, p. 62-64.

20a-86. Adjustable Edge-Drilling Jig. H. Moore. *Machinery* (London), v. 72, Jan. 22, 1948, p. 120.

Jig for drilling holes in the edges of flat metal plate.

20b—Ferrous

20b-8. Production Rate on Axle Housings Boosted. *Production Engineering & Management*, v. 21, Jan. 1948, p. 50.

New special-purpose machine tool which has made possible a noteworthy saving in machining time for banjo-type automotive rear-axle housings.

20b-9. Combination Rotary Boring and Recessing Attachments. *Screw Machine Engineering*, v. 9, Jan. 1948, p. 32-36.

Substitution of an 8-spindle automatic for two 6-spindle machines in production of diagrammed part. Slight modification without loss of quality also increases production by 42 pieces per hr.

20b-10. Machining Operations on Knitting Machine Components. *Machinery* (London), v. 72, Jan. 8, 1948, p. 35-42.

Methods and equipment used by a British firm.

20b-11. Ford Retools Cylinder Block Line With Transfer Machines. *Automotive Industries*, v. 98, Feb. 1, 1948, p. 38-39, 81.

20b-12. Cast Iron Gear-Shaving Increased 83%. *Steel*, v. 122, Feb. 9, 1948, p. 102.

How over 1500 crankshaft timing gears are processed each 8-hr. period per operator in Ford's Rouge plant by combining two high-production underpass machines with semi-automatic, air-operated loading.

20b-13. High-Speed Machining of Rear-Axle Housings on a "Transfer-matic". *Machinery*, v. 54, Feb. 1948, p. 161-164.

Production of automotive rear-axle housings on completely automatic transfer-type equipment; 20 housings are in the unit at one time, two housings being machined simultaneously at each station.

20b-14. Broaching Mating Parts on One Machine. *Machinery*, v. 54, Feb. 1948, p. 170-171.

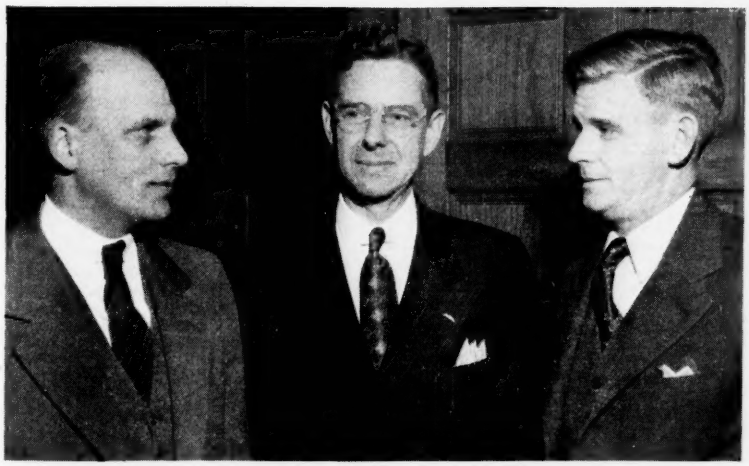
Application to machining of tractor-wheel hub and hub clamp.

20b-15. Needle Bearing Stabilizers Maintain Alignment. *Product Engineering*, v. 19, Feb. 1948, p. 104-105.

Use on hydraulic surface grinders.

(Turn to page 46)

Ernst Describes Metal Cutting Research



Hans Ernst (Center), Director of Research at Cincinnati Milling Machine Co., Spoke on "Metal Cutting Research" at the January Meeting of the Worcester Chapter A.S.M. Leo P. Tarasov (left), vice-chairman, presided, and Edward O. Fox (right) was technical chairman

Teaching Engineering Students to Communicate Accurately Is Problem

Reported by Louis Malpoker

Lincoln Engineering Co.

Certain limitations are imposed and certain qualities are necessary for success in engineering pursuits, Prof. H. L. Walker, head of the department of mining and metallurgical engineering, University of Illinois, stated in a talk on "Education of Engineering Students". Professor Walker addressed the annual joint meeting of the St. Louis Chapters of A.S.M. and Institute of Mining and Metallurgical Engineers and the St. Louis Engineers' Club on Jan. 22.

Professor Walker evaluated the distribution of required courses in specialized engineering curricula, and lamented the fact that free elective courses are generally insufficient in amount. The amount of collegiate work to be devoted to humanistic courses should lie between 20 and 25% of all courses pursued.

Teaching engineering students to communicate accurately with others is a special problem, and the methods practiced at the University of Illinois to rectify this defect were described by the speaker.

Professor Walker proposed that two types of engineering curricula should be provided. One of these would be similar to the present curriculum and the other would be scientific engineering without a high degree of specialization. The education of engineers is the responsibility not only of colleges and universities but also of every practicing engineer in the engineering societies, according to Professor Walker. He delineated the three stages of professional growth of engineers and the manner in which professional engineers can assist young men. Professor Walker believes the engineering societies also should assist in postcollegiate education.

The teaching of manual dexterity through shop courses, he asserted, has been greatly overvalued by many schools, for such types of shop courses lead to the production of "handbook engineers" who are a disgrace to the engineering profession.

Use of Inferior Oils Damages Equipment

Reported by A. Waydak

Engineering Dept., Chevrolet Motor Co.

The talk before the January meeting of the Saginaw Valley Chapter A.S.M. dealt primarily with lubrication in industrial hydraulic application and covered the kinds of oils, their cost and their effect on equipment. Frank Ross, national manager of the lubrication department of E. F. Houghton & Co., Philadelphia, was the speaker.

Oils may be bought either by standard trade names or by definite specifications, Mr. Ross said. In large companies ordering by specification is the more common method, although it may not always cover fully the requirements of the job. For example, two oils which have similar specifications as regards viscosity, flash, pour, and color at 100° F. may have entirely different characteristics at higher operating temperatures.

Use of inferior oils often necessitates frequent changing and consequent downtime of equipment. Use of proper premium oils has proved to be much more economical from that standpoint, even though the original cost is greater. Serious damage to equipment may be caused by sludging, breakdown of oil and consequent wear.

Additives used in the compounding of premium oils are oxidation inhibitors, gum solvent additives, rust inhibitors, viscosity index improvers, and oiliness agents.

To sum up, Mr. Ross pointed out that oils should be judged on the basis of performance on the job, since laboratory evaluation will not always correspond to actual usage. Finally, he cautioned, mechanical failures cannot always be attributed to, nor corrected by, a change of lubricants.

Car Owners Learn Reasons for Failure Of Sleeve Bearings

Reported by W. R. Holden

Plant Metallurgist, Canadair Ltd.

Digressing somewhat from the usual type of technical lecture at the February meeting of the Montreal Chapter A.S.M., W. E. Thill, engineer of Federal-Mogul Corp., discussed "Sleeve Bearing Problems" from the standpoint of the automotive and mechanical engineer. At the same time all car owners were enlightened on many facts concerning their automobiles, nor were the metallurgical aspects of bearing problems omitted.

Mr. Thill limited his topic to composite sleeve bearings. Failures to meet life expectancy (actually less than 1%) are generally attributable to such things as improper assembly, dirt under the sleeve during assembly (or resulting from contaminated circulating oil), fatigue failure caused by overloading in high gear in climbs or coming downhill in compression at too great a speed, failure of lateral thrust surfaces due to excessive clutch riding, misalignment due to warpage, or improper ventilation.

With ordinary care in installation, the speaker pointed out, bearing life is quite reproducible, permitting the application of preventive maintenance.

Among the bearing materials discussed were tin-base babbitts, high-lead babbitts, cadmium alloys, copper alloys, copper alloys overplated, aluminum alloys, silver and silver alloys overplated. The properties required of a bearing metal are fatigue resistance, conformability, embeddability, antiscoring tendencies, corrosion resistance, soft shaft operation, bond, temperature-strength ratio and thermal conductivity.

No alloy meets all these requirements fully, Mr. Thill said. An impartial assessment would place the alloys in the following ascending order of value: tin-base babbitt, lead-base babbitt, cadmium-silver and copper-lead.

Preceding Mr. Thill's discourse, a picture entitled "Operation Pluto" was presented under the auspices of the Drummond McCall Co. The design, manufacture and laying of the continuous steel tubes which supplied the fuel for Allied western operations subsequent to D-day were depicted with extreme clarity of detail.

20b-16. Drill Jigs Speed Output of Stove Burners. Walter Rudolph. *American Machinist,* v. 92, Feb. 12, 1948, p. 124-125.

By fixturizing many of its drill-press operations, Odin Stove Co. has more than doubled productive capacity and efficiency of the drilling department. The oven and top burners are gang-drilled with special mechanisms.

20b-17. Speeds and Feeds for Boring. *American Machinist,* v. 92, Feb. 12, 1948, p. 149.

Tables for steel and cast iron.

20b-18. Huge Lathe Speeds Turning of Diesel Crankshafts. *Tool Engineer,* v. 20, Feb. 1948, p. 25.

One of two lathes, each 45 ft. long, recently installed at Superior Engine Division of National Supply Co., Springfield, Ohio.

20b-19. Concealed Cost in the Chip Pile. H. J. Chamberland. *Production Engineering & Management,* v. 21, Feb. 1948, p. 69-71.

Worthwhile material savings can be effected in the processing of steel by utilizing contour sawing for removing the stock en masse, thus reducing amount of chip formation.

20b-20. Cutting an Increasing Twist in Gun Rifling. G. Tonn. *Machinery* (London), v. 72, Jan. 22, 1948, p. 118.

Machine-tool mechanism for the above process.

20d—Light Metals

20d-3. Fitting Magnesium Alloy Doors. *Aircraft Production,* v. 10, Jan. 1948, p. 17-18.

Use of special fixtures in drilling cast doors and frames of the Avro Tudor airplane.

20d-4. High-Speed Machining of Aluminum. *Iron Age,* v. 161, Jan. 22, 1948, p. 61.

Results of high-speed cutting tests of 14 S, 14 S-T, and 24 S-T alloys on a specially designed and constructed high-speed turret lathe. Surface cutting speeds up to 20,000 ft. per min., without any cutting or coolant fluids, were achieved and no indication of an upper speed limit was observed.

20d-5. Drilling Aluminum. *Reynolds Metals Technical Advisor,* v. 1, no. 6, p. 1-2.

Recommended procedures.

20d-6. One Machine—Fourteen Operations. *Die Castings,* v. 6, Feb. 1948, p. 60, 62, 64.

Use of Heald Model 322 double-end Bore-Matic with five boring heads and two holding fixtures to perform fourteen operations on a die-cast aluminum outboard-motor gear housing in an automatic cycle, including boring, facing, milling, and chamfering.

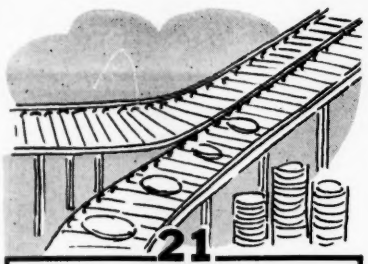
20d-7. Production of Housings Boosted by Special-Purpose Drill. *Production Engineering & Management,* v. 21, Feb. 1948, p. 60.

Installation of a new special-purpose drill reduced drilling time by 50% in production of cast aluminum housings for lawn mowers.

For additional annotations indexed in other sections, see:

4a-9; 27a-28.

NEW ENGLAND CARBIDE TOOL CO., INC.
Manufacturers of Precision Carbide Products
Cambridge 39 Massachusetts



21 MISCELLANEOUS FABRICATION

21a—General

21a-19. Automatic Feeding Devices. Paul H. Winter. *Tool Engineer,* v. 19, Jan. 1948, p. 39-41.

Mechanical feeding of parts substantially reduces machining and assembly costs on large production runs.

21a-20. Gas Turbine Blading. A. T. Colwell and R. E. Cummings. *Aircraft Production,* v 10, Jan. 1948, p. 24-28.

Current American practice in casting, machining, and fastening methods. (Condensed from paper presented to S.A.E.)

21a-21. Palletizing Doubles Warehouse Capacity of Pole-Line Hardware Manufacturer. William W. Hiller. *Steel,* v. 122, Feb. 2, 1948, p. 103, 119.

Materials handling methods used by Oliver Iron & Steel Corp. in handling bolts, nuts, various types of pole-line hardware, and automotive and railroad specialties.

21a-22. New GM Supplier Plant. Joseph Geschelin. *Automotive Industries,* v. 98, Feb. 1, 1948, p. 28-29, 64, 66.

Tells how decentralized unit in Ohio extends scope of parent Syracuse plant in manufacturing hub caps, bumper guards and grilles.

21a-23. The XC-99—Latest of World's Largest Landplanes. Thomas A. Dickinson. *Modern Industrial Press,* v. 10, Jan. 1948, p. 46-48.

Fabrication procedures.

21a-24. Coordinating Materials Handling With the Manufacturing Cycle. S. C. Hoey. *Steel,* v. 122, Feb. 9, 1948, p. 74-75, 106.

Previously abstracted from *Mechanical Engineering,* v. 69, Dec. 1947, p. 1007-1011. See item 25-205, R.M.L., v. 4, 1947.

21a-25. Handling Materials in the Foundry. Carl H. Moeller. *Foundry,* v. 76, Feb. 1948, p. 222-224, 226.

Methods used in several foundries.

21a-26. What Type of Fluid Power Shall I Use? Harry L. Stewart. *Machine and Tool Blue Book,* v. 44, Feb. 1948, p. 133-138, 140

Applications of hydraulic, airdraulic, and air power in industry. Principles governing the selection of a specific type of fluid power to meet a given service requirement.

21a-27. Master Tooling Dock. Frank Charity. *Steel,* v. 122, Feb. 16, 1948, p. 88-89, 124.

Use for various heavy-fabrication jobs.

21a-28. Freight Car Fabrication Fixturized. *American Machinist,* v. 92, Feb. 12, 1948, p. 120-123.

Applications in assembly procedure.

21a-29. Radiator Assembly Cost Cut by Conveyer Installation. Frank M. Scotten. *Production Engineering & Management,* v. 21, Feb. 1948, p. 53-56.

Installation of conveyerized equipment for radiator assembly and rebuilding of the radiator-parts processing line at Ford Motor has resulted in a 50% production increase and a reduction of time per unit.

21a-30. Automatic Brushing Cuts Downtime. *Production Engineering & Management,* v. 21, Feb. 1948, p. 59.

Unique brushing technique for cleaning conveyer chain.

21a-31. Volume Production Methods Speed Output of Jet Engines. *Production Engineering & Management,* v. 21, Feb. 1948, p. 61-68.

Improved processes and greater use of special-purpose tools at General Motors' Allison Division are serving to meet an accelerated demand for turbo-jet engines. Includes forging, heat treatment, machining, inspection methods and equipment.

21a-32. Engine Production in Australia. D. O. MacFarlane. *Aircraft Production,* v. 10, Feb. 1948, p. 57-61.

Miscellaneous technical problems encountered and progress in war and peace. (Presented to Australasian branch of the Royal Aeronautical Society, Sydney.)

21b—Ferrous

21b-8. Knitting Machine Manufacture. *Machinery* (London), v. 72, Jan. 1, 1948, p. 3-10.

Methods and equipment used by a British firm.

21b-9. Cast Iron Pipe Is an Engineering Product With High Quality Built Into Each Casting Under Control of Foundry Laboratories. *Cast Iron Pipe News,* v. 14, Jan. 1948, p. 16-21.

Production and test methods and equipment.

21b-10. Palmer Welloct Tool Corp. Ups Production 100% in Expansion Program. *Modern Industrial Press,* v. 10, Jan. 1948, p. 42, 44.

Miscellaneous procedures and equipment used in fabrication of machinist's tools and general hardware.

21b-11. Views of Plymouth, Mich., Plant of Evans Products Co. *Stove Builder,* v. 13, Feb. 1948, p. 42-46.

Production of oil-fired space heaters, water heaters, and furnaces.

21b-12. Advantages of Integrated Manufacturing. Gerald Eldridge Stedman. *Steel,* v. 122, Feb. 16, 1948, p. 85-87, 119, 122.

Equipment and procedures of plant where steel foundry, machine shop, fabricating and manufacturing departments cooperate closely to produce components for earth-moving equipment.

21b-13. Simple Brushing Setup Descales Conveyer Chain. *Products Finishing,* v. 12, Feb. 1948, p. 92.

Unique power-brushing technique that reduces conveyer-chain maintenance used in refrigerator plant.

21c—Nonferrous

21c-2. Making Motor Car Radiator Cores. *Machinery* (London), v. 72, Jan. 22, 1948, p. 99-107.

Use of semiautomatic machinery, by Ford Motor Co., Ltd.

21d—Light Metals

21d-2. De Havilland Dove; an Attractive Feeder-Line Aircraft of All-Metal Construction. Part I: Development and Design; Fuselage Structure; Fuselage Unit Assembly. Part II. Sectional Assembly of the Cabin Portion of the Fuselage: Fuselage Rear Section and Fin. *Aircraft Production,* v. 10, Jan. 1948, p. 9-14; Feb. 1948, p. 44-51. (To be continued.)

For additional annotations indexed in other sections, see:

1a-7; 16b-6; 18b-12.

(Turn to page 48)

Three-Man Symposium Reviews Factors In Successful Development of Jet Engine

Reported by R. A. Schmidt
Aluminum Co. of America

A symposium on the jet engine was hailed as the most popular event scheduled so far in this first year of the Purdue Chapter's existence. Three speakers covered the subject at the Jan. 20th dinner meeting, each discussing the contributions of his field to the successful development of the jet engine.

On the subject of magnesium applications, John C. McDonald, assistant technical director, magnesium division of Dow Chemical Co., pointed out that a large-scale magnesium industry is almost as new as the jet engine. Present-day casting alloys are mostly of the aluminum-magnesium-zinc system—in general 6 to 9% Al and 2 to 3% Zn.

Forty-four cast magnesium parts, ranging from 100 lb. to ¼ lb., are used on one typical jet engine. The characteristics most sought for this use are corrosion resistance, fatigue resistance, damping qualities, low porosity and high tensile strength. Shot-peening applied to the as-cast surfaces has shown good results, and is easily controlled. Either zinc or cerium may be a predominant alloy element in the future, Dr. McDonald noted; both of them act to increase high-temperature creep strength.

W. O. Sweeny, of the precision casting sales division of Haynes Stellite Co., chose "Thermal Resistance in the Jet Engine" for his subject. There are three general groups of superalloys used for turbine blades and buckets, namely: wrought materials, strain hardened; wrought materials, heat treated; and cast alloys, heat treated. Cast alloys are most favored, usually those with a nickel-cobalt base in which chromium, molybdenum and tungsten are the chief alloying elements. These alloys have high tensile and creep resistance above 1500° F.

Mr. Sweeny commented on the increased usage of the term "stress elongation", which is a short-time **creep test of 50 to 100 hr.** The average life of a jet engine is about 150 hr., so the early stages of creep are most significant to the turbine designer.

A. W. F. Green, chief metallurgist of Allison Division of General Motors Corp., opened his talk on "Metallurgical Problems Involved in the Jet Engine" with some interesting historical facts.

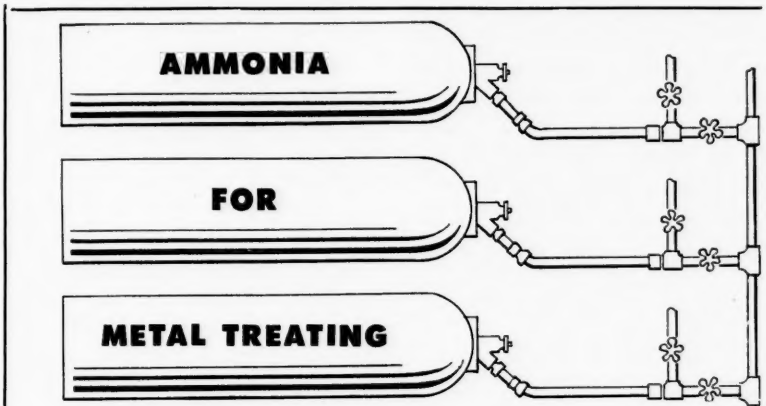
The jet engine is considered to be in the experimental stages, he said, yet there are thousands flying, and the power a unit can develop exceeds by far that available in the largest reciprocating engine. The horsepower-weight ratio is about 4.5-1 for jet engines, compared to the long-sought 1-1 ratio for reciprocating engines.

Mr. Green told of experiences with the heat resistant alloys available in the early days of jet engines, and traced the development of present-day alloys, along with the fabricating and inspection techniques that had to be devised. He pointed out that if it were necessary to build as much jet horsepower as was used by all our planes in the last war, there would not be enough of some of our critical metals to do the job. The answer to this may be in skin cooling, powder metals, and refractory coatings.

M. J. Zucrow, professor of gas turbines and jet propulsion at Purdue University, served as technical chairman. He outlined the properties of an ideal metal for turbine blades and buckets, and observed that the best available today falls far short. He also compared European jet engine development with American, and briefly described a Swiss invention for increasing compression ratios without adding stages.

Moves to New York Office

JOHN L. BURNS, partner of Booz, Allen & Hamilton, management consultants with offices in New York, Chicago and Los Angeles, has moved his headquarters from Chicago to New York. Mr. Burns is a director of the Globe Steel Tubes Co. and of R. R. Robertson Co., a registered professional engineer, and past chairman of the Chicago Chapter A.S.M.



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22 JOINING and FLAME CUTTING

22a—General

22a-19. How to Use Arc Welding Electrodes. H. O. Westendarp, Jr. *Steel Processing*, v. 34, Jan. 1948, p. 20-22, 44.

The four fundamentals of welding technique which affect the deposition of weld metal: current setting, length of arc, angle of electrode, and speed of travel.

22a-20. Adhesives for Gluing Thin Metal Sheets. Francis A. Westbrook. *Steel Processing*, v. 34, Jan. 1948, p. 26-28.

Synthetic resin adhesives for joining thin metal sheets have become a production tool. Originally designed for aluminum and other light metals, the adhesives will now bind carbon and stainless steel sheets with greater bonding power than rivets.

22a-21. Welding on the Farm. *Linde Tips*, v. 27, Jan. 1948, p. 5-7.

Miscellaneous repair and fabrication techniques for the farm welding shop.

22a-22. Here Are the Fluxes. *Linde Tips*, v. 27, Jan. 1948, p. 20-21.

When and how to use the various types.

22a-23. Inert-Gas Shielded-Arc Welding. Part I. What It Is—Advantages—When to Use It—Apparatus. *Sheet Metal Worker*, v. 39, Jan. 1948, p. 93-95.

22a-24. Some Properties of Soft Solders. P. Hydrean, *Sheet Metal Worker*, v. 39, Jan. 1948, p. 103-105.

Choice of the best type for the particular job.

22a-25. Resistance Welding in Mass Production; Hot Riveting Principles and Applications. A. J. Hipperson and T. Watson. *Welding*, v. 16, Jan. 1948, p. 30-38.

Twelfth of series deals with the scope of the hot riveting process, its advantages, types of rivet-head shape, suitable arrangement of the workpiece, and equipment used.

22a-26. Inert-Gas Shielded-Arc Welding. H. T. Herbst. *Engineers' Digest* (American Edition), v. 5, Jan. 1948, p. 4.

Views on the newest method of fusion welding now in commercial use.

22a-27. Welding High-Temperature Alloys. *Product Engineering*, v. 19, Feb. 1948, p. 138-139. Condensed from "Welding Characteristics of Various High-Temperature Alloys", by C. G. Chisolm.

Previously abstracted from *Steel*, v. 121, Dec. 29, 1947, p. 54-56, 58, 60. (Presented at annual meeting of A.W.S., Chicago, Oct. 21, 1947.) See item 22-783, R.M.L., v. 4, 1947.

22a-28. Short-Cut Estimation of Welded Process Vessels. Harlan How. *Chemical Engineering*, v. 55, Jan. 1948, p. 122-126.

When price information on welded vessels is unavailable, the charts given will assist in making rough cost estimates covering gas cutting, plate rolling, edge preparation, welding labor, welding rod, and flux for butt and fillet welds of U-69. U-70, and A.P.I.-A.S.M.E. quality in carbon steel, chromium nickel steel, stainless and nickel-clad steels, and Cu-Si alloys; several kinds of nozzles; and the machining of plate flanges and heads. Some data are applicable to weldments other than vessels.

22a-29. Maintenance of Welding Machines. C. A. Lehton and H. F. Worcester. *Western Machinery and Steel World*, v. 39, Jan. 1948, p. 85-87.

At Ryan Aeronautical Co., San Diego.

22a-30. Shape-Welding by the Submerged-Melt Welding Process. J. A. Kratz. *Welding Journal*, v. 27, Jan. 1948, p. 5-10.

Methods used in mechanized shape welding—that is, the joining of pieces of an assembly in which the direction of the weld changes as the welding action proceeds. (Presented at 28th Annual Meeting, A.W.S., Chicago, week of Oct. 19, 1947.)

22a-31. Survey of Automatic Arc and Gas Welding Processes as Used in the Automotive Industry; A Committee Report. *Welding Journal*, v. 27, Jan. 1948, p. 27-35.

Brief, general discussion of submerged arc welding; automatic shielded metal-arc welding; automatic bare metal-arc welding; automatic carbon-arc welding; automatic atomic-hydrogen welding; automatic inert-gas shielded metal-arc welding; and automatic oxy-acetylene welding.

22a-32. Multiple Flame Pressure Welding Process. N. H. Cuke. *Welding Journal*, v. 27, Jan. 1948, p. 39-47.

"Closed-butt" and "open-butt" methods, with particular emphasis on the latter method. 13 ref. (Presented at 28th Annual Meeting, A.W.S., Chicago, week of Oct. 19, 1947.)

22a-33. Welded Fabrication. J. R. Stitt. *Welding Journal*, v. 27, Jan. 1948,p. 48-51.

Various stress patterns established during an arc welding process. (Presented at 28th Annual Meeting, A.W.S., Chicago, week of Oct. 19, 1947.)

22a-34. Welding a Roto-Clone Impeller. Harrington Powers. *Welding Journal*, v. 27, Jan. 1948, p. 51-52.

22a-35. Structural Failure of a Riveted Ship. E. M. MacCutcheon. *Welding Journal*, v. 27, Jan. 1948, p. 52-54. Reprinted from *Proceedings of the Merchant Marine Council*, May 1947.

Comparison with certain welded ship failures.

22a-36. Air Reduction's New Apparatus Research Laboratory Developing Additional Uses for Industrial Gases. *Welding Journal*, v. 27, Jan. 1948, p. 73-74.

The injection of industrial gases into molten metals, the oxy-acetylene cutting of steel while the metal is still hot and surface conditioning of stainless steel are examples of the laboratory's developments on which applied research is being conducted.

22a-37. Pressure Vessel Research. *Welding Journal*, v. 27, Jan. 1948, p. 5s-6s.

Proposed research of the Pressure Vessel Research Committee of the Welding Research Council.

22a-38. Note on the Influence of $CaCO_3$ Additions to the Electrode Coating on the Composition of the Arc Atmosphere. Manley W. Mallett. *Welding Journal*, v. 27, Jan. 1948, p. 28s-29s.

Values for different commercial and experimental electrodes.

22a-39. Welding Jig for Salvaging Drilled Parts. Donald A. Baker. *Machinery*, v. 54, Feb. 1948, p. 179.

22a-40. Examining Cost Factors and Solving Important Problems at International Harvester With Welding Research. *Industry and Welding*, v. 21, Feb. 1948, p. 26-29, 63.

22a-41. Application and Procedures for E 6013 and XX 13 Electrodes. Lew Gilbert. *Industry and Welding*, v. 21, Feb. 1948, p. 30-32, 34, 39.

Useful data based on exhaustive production tests.

22a-42. Saving Money on Tools and Fixtures; Part I. E. H. Girardot. *Industry and Welding*, v. 21, Feb. 1948, p. 48, 50, 52-55.

Repair jobs done with oxy-acetylene, resistance and arc welding.

22a-43. Adhesives for Metalworking. H. E. Linsley. *American Machinist*, v. 92, Feb. 12, 1948, p. 107-118.

Properties and applications with particular reference to such processes as Pliobond, Cycle-Bond, Redux, Metlbond, Plycozite, Plastilock, and Reanite.

22a-44. Inert-Gas Shielded-Arc Welding Method. H. T. Herbst. *Light Metal Age*, v. 6, Feb. 1948, p. 20-24.

Application to a large variety of metals. Joint types—with and without welding; rods; selection of welding current; welding jigs; starting the arc; starting and stopping the weld seam; shape welding; weld packing; cleaning the metal prior to welding.

22a-45. New Techniques in Glass-to-Metal Sealing. Joseph A. Pask. *Proceedings of the I.R.E.*, v. 36, Feb. 1948, p. 286-289.

The new techniques described include accurate and controlled oxidation of the metal, and the powder-glassing method of making seals. The accompanying experimental data refer to Kovar, since most of the laboratory work has been on glass-to-Kovar seals. Data are presented for oxidation at a number of controlled temperatures and varying times. Hypotheses on the function of H_2 baking of Kovar, adherence of glass to Kovar, and nature of the oxidation process are presented.

22a-46. Instruments for the Measurement of the Main Variables in Resistance Welding Machines. *Welding Research*, v. 1 (Bound with *Transactions of the Institute of Welding*, v. 10), Dec. 1947, p. 19-24.

First interim progress report of the FR. 5 Committee of the British Welding Research Association on development of devices for measuring current, pressure, and time in resistance welding machines. Satisfactory instruments of a simple, accurate, and sturdy nature have been developed for the measurement of secondary current and welding time. Work is continuing on the design of a suitable current transformer and an insert, either of which can be used in conjunction with the impulse ammeter. The more difficult problem of the measurement of dynamic pressure during welding is continuing to receive attention.

22a-47. Stability of Power Supply for the Electric Arc Under Welding Conditions. (In Russian). V. P. Nikitin. *Izvestiya Akademii Nauk SSSR. Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the U.S.S.R., Section of Technical Sciences). Oct. 1947, p. 1315-1322.

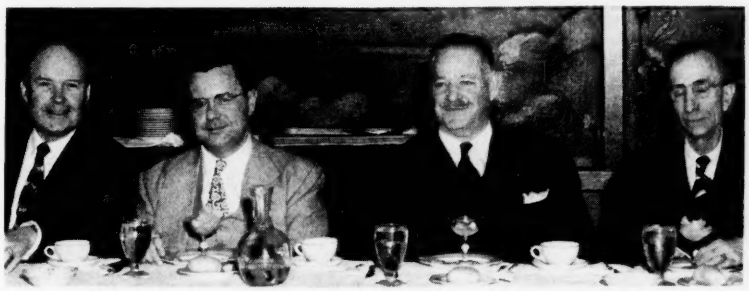
Proposes a series of equations for calculating the conditions required in order to maintain a stable power supply.

22b—Ferrous

22b-20. Open-Butt Pressure Welding of Steel. H. R. Clauser. *Materials & Methods*, v. 27, Jan. 1948, p. 83-86.

(Turn to page 50)

Buffalo Host to National Officers



Buffalo Chapter was Host to A.S.M. National Officers at Its January Meeting. Left to right are National President Francis Foley; E. M. Galbreath, chapter chairman; W. H. Eisenman, national secretary; and J. H. Birdsong, secretary of the Buffalo Chapter for the past ten years. Messrs. Foley and Eisenman were guests at the afternoon meeting of the Executive Committee, and in the evening Mr. Foley presented the main address on "Alloys for Elevated Temperatures"

New Appointments Made To Education Committee

Six new appointments to the A.S.M. Advisory Committee on Metallurgical Education have recently been made by President Francis B. Foley. The entire personnel of the committee is listed below, with the new appointments shown in italic type:

R. F. Mehl, Carnegie Institute of Technology, Pittsburgh, Chairman
C. B. Carpenter, Colorado School of Mines, Golden, Colo.
John Chipman, Massachusetts Institute of Technology, Cambridge.
Arthur E. Focke, Diamond Chain Co., Indianapolis, Ind.
M. A. Grossmann, Carnegie-Illinois Steel Corp., Pittsburgh
M. A. Hunter, Rensselaer Polytechnic Institute, Troy, N. Y.
W. E. Jominy, Chrysler Corp., Detroit
William A. Mudge, International Nickel Co., New York City
C. F. Nagel, Jr., Aluminum Co. of America, Pittsburgh
L. M. Pidgeon, University of Toronto, Toronto, Canada
Robert Stout, Lehigh University, Bethlehem, Pa.
John W. W. Sullivan, American Iron and Steel Institute, New York City
Alexander R. Troiano, University of Notre Dame, South Bend, Ind.
Thomas Washburn, Inland Steel Co., East Chicago, Ind.
R. E. Zimmerman, United States Steel Corp., Pittsburgh

Salt Baths Play Important Role in Heat Treat Advance

Reported by Leston B. Stark
Metallurgist
U. S. Navy Electronics Laboratory

Recent advances and applications of salt bath heat treatment and the place they take in conjunction with other methods of heat treatment were presented before the San Diego Chapter A.S.M. on Jan. 20. Robert C. Sherwood, vice-president of the California-Doran Heat Treating Co. of Los Angeles, was the speaker.

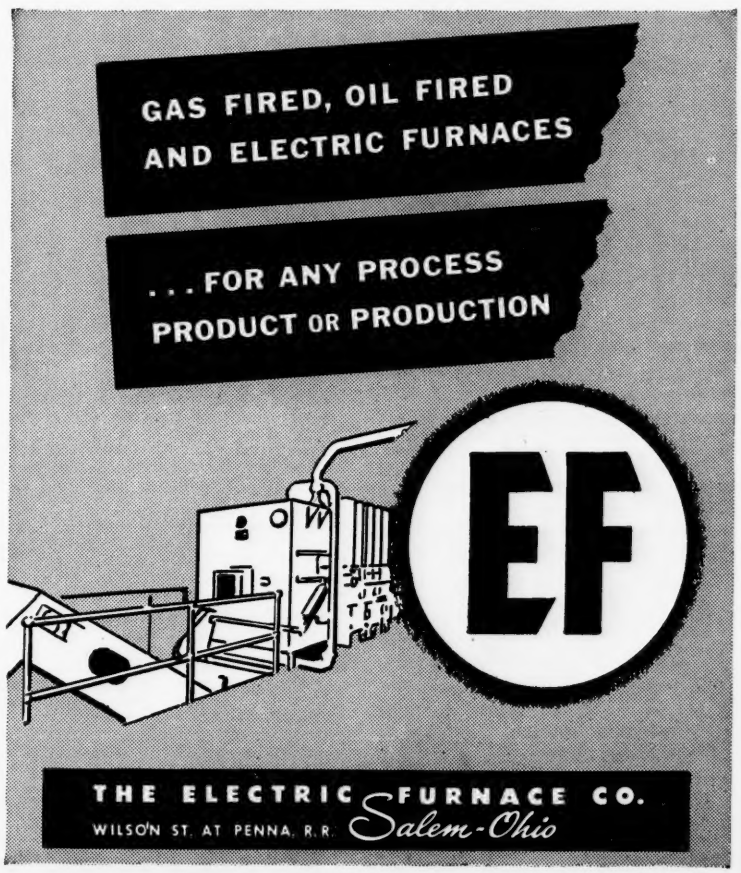
Mr. Sherwood emphasized the importance of heat treatment in metallurgical processing today. Heat treating techniques have kept pace with advances in steel alloying, and salt baths have played an important part in this continued progress. Heat treatment is often the deciding factor in obtaining the better physical properties of metals demanded by modern engineering requirements.

The salt baths used commercially for neutral hardening (tempering and quenching) include barium chloride, "triple chloride", nitrate, and mixtures of sodium hydroxide and sodium carbonate. Mr. Sherwood also mentioned the types of containers most applicable for given salt baths.

Three of the most troublesome problems encountered in heat treatment—namely, lack of uniformity of furnace temperature; chemical effects, such as scale and decarburization; and dimensional changes causing quench cracking and warping—are largely reduced or eliminated by the use of salt baths.

A full discussion of austempering, martempering and isothermal quenching, by the use of the latest S-curve for S.A.E. 4140 steel, completed the lecture. In conclusion, Mr. Sherwood gave concrete examples of the practical applications that utilize the best features of each of these three processes.

Among the many interesting practical and theoretical heat treating problems discussed after the formal lecture was one posed by a representative of the materials processing department of the Rohr Aircraft Co. in connection with the heat treatment of large stainless steel sheets.



New oxy-acetylene welding process which can be used on a variety of steel types, shapes, and forms.

22b-21. Want To Improve Your Hand-Cutting? *Linde Tips,* v. 27, Jan. 1948, p. 8-9.

Recommendations for proper technique.

22b-22. How to Make a Small Anvil. *Linde Tips,* v. 27, Jan. 1948, p. 9.

Made from scrap rail by flame cutting.

22b-23. New Life for the Old Car. *Linde Tips,* v. 27, Jan. 1948, p. 10-11.

Reclamation of worn and broken parts by welding.

22b-24. Bronze Welding Saves Time. *Linde Tips,* v. 27, Jan. 1948, p. 12.

Use of preheating in repairing a roller casting.

22b-25. To Salvage Worn Pistons. *Linde Tips,* v. 27, Jan. 1948, p. 15.

Rebuilding of worn surfaces with bronze and cast-iron rod.

22b-26. ABC's of Hard Facing. *Linde Tips,* v. 27, Jan. 1948, p. 16.

22b-27. Groove-Cutting—a Process for the Small Shop. *Linde Tips,* v. 27, Jan. 1948, p. 17-18.

Use of special nozzle in standard Prest-O-Weld or Purox cutting blowpipe to remove steel surface metal quickly without chipping or grinding.

22b-28. Induction Brazing Increases Output on Assembly Operation. *Production Engineering & Management,* v. 21, Jan. 1948, p. 54.

How processing time has been reduced to 7½ sec. per unit for a three-piece lawnmower rotor by use of induction heating with special ceramic fixtures.

22b-29. The Causes of Explosion of Some Welded Low Pressure Containers. Th. Wyss. *Engineers' Digest* (American Edition), v. 4, Dec. 1947, p. 568-570. Translated and condensed from *Zeitschrift fur Schweisstechnik,* v. 37, March 1947, p. 55-61; and June 1947, p. 127-130.

Five failures are illustrated and faulty design features are pointed out. Resulting standards of the Swiss Federal Institute for testing materials are outlined.

22b-30. Things Are Humming at Willow Run and Welding Does Its Share to Speed Production. *Weld,* v. 4, Jan. 1948,p. 5-7.

22b-31. Arc in the Barnyard. Robert West Howard. *Weld,* v. 4, Jan. 1948, p. 12-16. Reprinted from *Steelways.* See 23-252, R.M.L., v. 4, 1947 *(Metals Review,* Aug. 1947).

22b-32 Bum Welds—and What Makes Them. Frederick S. Dever. *Welding Engineer,* v. 33, Feb. 1948, p. 36-39, 43.

Various types of defects illustrated and analyzed. Deals mainly with stainless steel.

22b-33. Big Beam Break and Bend. LaMotte Grover. *Welding Engineer,* v. 33, Feb. 1948, p. 44-48.

Data for use in construction of welded bridges, ships, and buildings. Results of testing to failure of large welded box girders at various temperatures.

22b-34. Submerged-Melt Welding Makes Water Heater Tanks. *Welding Engineer,* v. 33, Feb. 1948, p. 52-55.

Joining of heads and bottoms to tank shells in one operation by a specially built submerged-melt welder, which turns out a completed tank in 1.01 min.

22b-35. A.W.S. Electrode Classifications. Part I—All-Position Types. *Welding Engineer,* v. 33, Feb. 1948, p. 67.

Data sheet covers E 6010, E 6011, and E 6012 types.

22b-36. Welding Stainless Steel Tanks Without Distortion or Buckling. *Steel,* v. 122, Feb. 2, 1948, p. 110.

Technique used by National Tank Mfg. Co., Los Angeles.

22b-37. New Welsh Steel Plant. *Welding,* v. 16, Jan. 1948, p. 3-6.

The buildings are of steel-framed construction and welding will be extensively used in their assembly.

22b-38. British Shipbuilding—4. The Cowes' Yards of J. Samuel White. J. A. Oates. *Welding,* v. 16. Jan. 1948, p. 7-14.

22b-39. Aeromatic Welding Procedures Lower Hub Costs. *Aviation Week,* v. 48, Feb. 2, 1948, p. 24-27. Based on "Development of Arc Welded Propeller Hubs", by Paul C. Hackathal, C. C. Mast, and D. W. Hamilton; prizewinner in James F., Lincoln Welding Foundation contest.

Arc welded tubular hubs reduced weight, fabrication time, and cost. The material previously used was Cr-Mo steel, forged and machined. Now, finished and annealed S.A.E. 4130 seamless steel tubing is the starting material.

22b-40. Rapid Manual Welding Using an Ultra-Short Arc and the Resulting Saving in Electrical Energy. (In Russian.) A. D. Bondarenko. *Promyshlennaya Energetika* (Industrial Power), v. 4, Oct. 1947, p. 1-5.

The essential difference between the method described and usual practice is a very thickly coated electrode used. This coating serves both as an insulator between the core of the electrode and the weld, and forms a shield between the end of the coating and the core on melting. Industrial application; comparison with other types of arc welding.

22b-41. Investigation of the Strength of Bronze Welded Joints. M. S. Fisher and H. Brooks. *Engineers' Digest* (American Edition), v. 5, Jan. 1948, p. 36.

Previously abstracted from *Transactions of the Institute of Welding,* v. 10, Oct. 1947, p. 149-160. See item 22-762, R.M.L., v. 4, 1947 *(Metals Review,* Jan. 1948.)

22b-42. Welding Techniques for Cast Iron. T. E. Kihlgren. *Welding Journal,* v. 27, Jan. 1948, p. 19-25.

Arc welding techniques using nonferrous electrodes of the Ni or Ni-Cu type. (Presented before A.W.S., New Jersey Section, at Newark, May 20, 1947.)

22b-43. High-Speed Oxy-Acetylene Tube Welding. H. O. Jones. *Welding Journal,* v. 27, Jan. 1948, p. 25-26.

Development of equipment for the above and experiments successfully carried out at a number of commercial installations by Air Reduction Co. (Presented at 28th Annual Meeting, A.W.S., Chicago, week of Oct. 19, 1947.)

22b-44. Let Contraction Do the Heavy Work. E. F. Kurzinski. *Welding Journal,* v. 27, Jan. 1948, p. 37-38.

Methods for correcting distortion during certain welding operations.

22b-45. Use of Carbide-Stabilizing Elements to Improve Weldability of Plate Steels. F. F. Franklin. *Welding Journal,* v. 27, Jan. 1948, p. 20s-26s.

Functions of carbide-stabilizing elements in the welding operation, and how they may be utilized to improve the welding properties of steels, particularly the low-alloy high-strength types.

22b-46. Hydrogen Embrittlement in Oxy-Acetylene Pressure Welding? K. B. Young and H. J. Nichols. *Welding Journal,* v. 27, Jan. 1948, p. 30s-32s.

Preliminary qualitative tests which indicate that brittleness may result from localized heating with a slightly reducing flame, followed by air cooling.

22b-47. Copper-Bar Semi-Automatic Welding. F. W. Myers. *Iron Age,* v. 161, Feb. 5, 1948, p. 70-74.

A German development called the Elin-Hafergut or copper-bar, arc welding technique and its merits and disadvantages.

22b-48. Shape Welding. *Mechanical Engineering,* v. 70, Feb. 1948, p. 153-156. Based on **Shape-Welding by the Submerged-Melt Welding Process,** by J. A. Kratz. (Presented at 28th Annual A.W.S. Meeting, Chicago, Oct. 1947.)

22b-49. Threadless Pipe Fittings. *Mechanical Engineering,* v. 70, Feb. 1948, p. 148-150.

Describes commercial products, their installation and application. They are made of black malleable iron and are used to join steel or wrought-iron pipe by brazing.

22b-50. "Custom Built" Installation Boosts Welded Tank Output. *Steel,* v. 122, Feb. 9, 1948, p. 104.

Continuous automatic welding setup.

22b-51. Effective Automatic Soldering. W. R. Graham. *Machinery* (London), v. 72, Jan. 15, 1948, p. 78-81.

Setup for soldering together the two halves of the case of a commercial-type oil filter.

22b-52. Automatic Welding Speeds up Box-Car Production. Charles O. Herb. *Machinery,* v. 54, Feb. 1948, p. 143-150.

Methods applied at Chicago Plant of American Car and Foundry Co.

22b-53. Radiographing and Controlled Low-Temperature Stress-Relieving of Welded Tanks for Wet Seal Gas Holder. Rudolf Kraus. *American Gas Journal,* v. 168, Feb. 1948, p. 11-16.

Previously abstracted from *Welding Journal.* See item 22-763, R.M.L., v. 4, 1947. (Presented at 28th annual meeting, A.W.S., Chicago, week of Oct. 19, 1947.)

22b-54. Arc Welding Broken Locomotive Frames. A. L. Havens. *Railway Mechanical Engineer,* v. 122, Feb. 1948, p. 82-83.

22b-55. Building up Locomotive Multiple Guides by Welding. *Railway Mechanical Engineer,* v. 122, Feb. 1948, p. 84.

22b-56. Carbon and Alloy Steels; Factors Governing Their Weldability. T. L. H. Butterfield. *Welding,* v. 16, Jan. 1948, p. 15-22.

An introductory short metallurgical survey of the nature of carbon and alloy steel. (To be continued.)

22b-57. Pouvoir Trempant et Soudure des Aciers. (Hardenability and Welding of Steels). H. Granjon. *Revue de Métallurgie,* v. 44, May-June 1947, p. 187-192.

Changes in the structure of various types of steel during oxy-acetylene and arc welding were studied experimentally in order to determine effects of the hardenability on weld strength.

22b-58. Periodicity of the Process of Preliminary Crystallization in the Weld Crater During Welding Under Flux. (In Russian). B. I. Medovar and A. M. Makara. *Avtogennoe Delo* (Welding), Oct. 1947, p. 1-5.

The primary crystallization process is shown to have a periodic character. This causes formation of a laminated structure in the weld metal. The following facts were determined: thickness of the layers for a given seam is constant; periodicity of crystallization promotes agitation of the molten metal in the the weld crater; and the differences

(Turn to page 52)

Furnace Brazing of Cylinder Blocks for Crosley Described

Reported by L. Wiley Cooper
Iowa State College

The successful application of copper brazing in controlled atmosphere furnaces depends on interference or press fits of the parts to be brazed, according to Norbert K. Koebel of the Lindberg Engineering Co., who spoke at the January meeting of the Des Moines Chapter A. S. M. on Jan. 13.

A discussion of the furnace brazed cylinder block for the new Crosley automobile engine aroused great interest. Mr. Koebel also showed slides of other copper brazed articles, such as an experimental head for a six-cylinder diesel engine. The head consisted of approximately 300 parts, most of them joined by copper brazing. The assembly was designed as a possible replacement of a cast iron structure with which great difficulty had been experienced in proper alignment of the complicated coring required for the cooling and exhaust passages as well as the valve ports.

The ½ and ¾-in. steel plates used in the assembly definitely prove that copper brazing need not be restricted only to the fabrication of thin-gage assemblies.

Following the lecture and presentation of slides, Mr. Koebel exhibited a large assortment of representative parts that had been furnace brazed, for the inspection of members and guests. The products ranged from small two-piece assemblies of light-gage steel to the complete Crosley engine block.

Many Rare Metals Readily Available If Uses Develop

Reported by N. H. Keyser
Alternate Group Leader
Los Alamos Scientific Laboratory

Many metals commonly thought to be relatively rare are actually available in greater quantities in the earth's crust than other metals we see in every day use, Bruce Gonser of Battelle Memorial Institute pointed out before a large turnout of the Los Alamos Chapter A.S.M. on Dec. 16. "Unusual Metals and Their Importance" was the title of his talk.

Some of these metals are relatively uncommon because sufficient use for them has never been developed to warrant their extraction on a large scale, he explained. Other metals can be produced cheaply and in large quantities but because of certain characteristics have limited use.

Many rare elements may be concentrated in the future if greater uses should be developed. Not to be overlooked are the possibilities of biological concentration from sea waters. Prospecting methods may be extended to discover and develop large offshore deposits.

Discussing the present and future for industrial and scientific applications, Dr. Gonser said that some of the unusual metals allow an entirely new approach to the solution of certain high-temperature problems, both in the form of metals and in the form of refractory compounds.

The meeting was concluded with a lively discussion.

Atlas Drop Forge Official Dies of Train Injuries

Fatally injured when his car was struck by a train, NORRIS R. BUCKINGHAM, vice-president and general manager of Atlas Drop Forge Co., Lansing, Mich., died on Dec. 12. Mr. Buckingham had spent his entire business life with the Atlas company, beginning in 1916 as a boy of 17. By practical shop experience, plus overtime study, he advanced from shop helper to top management. In addition to the A.S.M., Mr. Buckingham held membership in the Society of Automotive Engineers and the National Drop Forging Association.

M. H. Frommann

MILTON H. FROMMANN, 49, general superintendent of the Townsend Co., specialty steel manufacturers in New Brighton, Pa., died on Jan. 11 following a short illness. Mr. Frommann was a member of the Pittsburgh Chapter A.S.M.

Electro Metallurgical Names Walter Remmers President

Election of WALTER E. REMMERS as president has recently been announced by Electro Metallurgical Co. Mr. Remmers also was elected president of Electro Metallurgical Co. of Canada, Ltd., and other associated units. He is a past chairman of the Chicago Chapter A.S.M.

W. E. Remmers

Mr. Remmers has been vice-president and director of Electro Met since 1945. He is a graduate of Missouri School of Mines and Metallurgy, and did postgraduate work in metallurgy at University of Michigan. He has been associated with various units of Union Carbide and Carbon Corp. since 1936.

Boston Adds to Quarter-Century Club

Nine Silver Certificates Were Presented to Boston Chapter Members Who Have Completed 25 Years Membership in the American Society for Metals. Holding their awards are (back row, standing, left to right): P. G. Fairbanks, R. S. Williams, R. A. Johnston and C. F. Hawkridge. Front row, seated, are: G. B. Waterhouse, H. H. Lester and E. N. Downing, who received J. M. Darke's certificate because of the latter's illness. The awards were made on Feb. 6, which was also National President's Night. F. B. Foley spoke on "Heavy Forgings". (Reported by W. L. Badger, General Electric Co.; photo by H. L. Phillips)

Opens Consulting Office

MARVIN J. UDY, consulting engineer in Niagara Falls, N. Y., has announced the opening of his office for practice as consulting engineer in the field of process metallurgy, ferrous and nonferrous, and in the production of ferro-alloys, phosphorus and calcium carbide, and in general electric furnace smelting.

of chemical composition in the weld metal are very small.

22b-59. Welding of Bessemer and Thomas Steels. (In Russian). G. P. Mikhailov. *Avtogennoe Delo* (Welding), Oct. 1947, p. 9-11.

Results of an investigation made to determine optimum conditions.

22b-60. A Process for Determination of the Weldability of Steels. (In Russian). N. A. Sholotov. *Avtogennoe Delo* (Welding), Oct. 1947, p. 11-14.

Proposes four new qualitative methods, each of them particularly adapted to a different structural form to which welding is applied.

22b-61. Service Wear Resistance of Different Types of Welded Rail Joints. (In Russian). E. V. Sokolov. *Avtogennoe Delo* (Welding), Oct. 1947, p. 14-20.

Welded rail joints of the contact, thermit, and arc welded types were investigated both in the laboratory and in service. The results were in good agreement and indicated the superiority of contact welding. Test methods and data obtained.

22b-62. Automatic Flash Welding of "LZh. 350" Motorcycle Frames. (In Russian). G. R. Dobis. *Avtogennoe Delo* (Welding), Oct. 1947, p. 20-21.

The machine and the welding conditions **used.**

22b-63. Standardization of Oxygen-Cutting Procedures Using Gasoline, Kerosene, and Acetylene. (In Russian) I. S. Smirnov. *Avtogennoe Delo* (Welding), Oct. 1947, p. 23-28.

Standard times for cutting various sizes of different shapes are tabulated for the different fuels.

22c—Nonferrous

22c-2. Coils for Atom Smashers. I. A. Oehler. *Welding Engineer,* v. 33, Feb. 1948, p. 56-58.

Use of flashbutt welding to join heavy-section aluminum and copper strips into continuous coil windings for giant cyclotron magnets at American Welding & Manufacturing Co.

22c-3. Storage Battery Work. L. S. Bowser. *Welding Journal,* v. 27, Jan. 1948, p. 36-37.

Welding methods used in making new batteries and repairing old ones.

22c-4. The Welding of Nonferrous Metals—Part IX. The Welding of Nickel and its Alloys. (Concluded.) E. G. West. *Sheet Metal Industries,* v. 25, Jan. 1948, p. 147-154.

22c-5. Welding of Copper and Copper Alloys. Maurice Cook and Edwin Davis. *Transactions of the Institute of Welding.* v. 10, Dec. 1947, p. 178-192; discussion, p. 193.

Welding techniques and procedures for metal-arc, carbon-arc, and gas welding. 20 ref. (Presented at joint meeting of Institute of Metals and Institute of Welding, London, April 30, 1947.)

22d—Light Metals

22d-1. Inert-Gas Welded Aluminum Tanks. H. R. Toll. *Welding Engineer,* v. 33, Feb. 1948, p. 33-35.

Experiences in building tanks 40 ft. long by 11 ft. o.d.

22d-2 Flame-Brazed Joints in Aluminum Busbar and Their Radiographic Examination. F. Clark and F. P. Vickers. *Welding,* v. 16, Jan. 1948, p. 23-27.

Development work on the brazing of aluminum bars in thicknesses up to ½ in. such as are used in electrical circuits. (To be continued).

22d-3. Further Investigation of Preheating and Postheating in Spot Welding 0.040-In. Alclad 24 S-T. W. F. Hess and F. J. Windsor. *National Advisory Committee for Aeronautics, Technical Note* No. 1440, Dec. 1947, 13 pages.

All welding was done with an a.c. machine, using a program timer to sequence the preheat and weld, or the weld and postheat, cycles. Weld time is very important with regard to the quality of welds produced, With properly prepared surfaces, preheating produced some improvement in quality when the preheat current was sufficiently high in magnitude and of long duration. Postheating had no effect on the weld strength or quality, unless the magnitude of the postheating current was at least equal to that of the welding current.

22d-4. Testing of Electrically Welded Constructional Components of Aluminum Alloys. L. Huguenin. *Engineers' Digest* (American Edition), v. 5, Jan. 1948, p. 27-28. Translated and condensed from *Schweizer Archiv,* v. 13, July 1947, p. 202-210.

Previously abstracted from original article. See item 22-673, R.M.L., v. 4, 1947.

22d-5. The Pressure Welding of Light Alloy Bar Without Fusion. R. F. Tylecote. *Sheet Metal Industries* v. 25, Jan. 1948, p. 155-160, 162, 164.

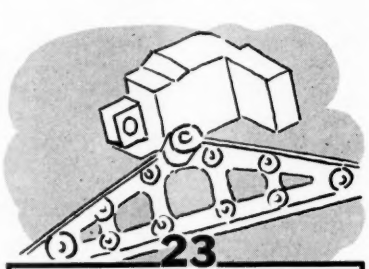
Investigation of the welding of a series of Al and Mg alloys, using a 10-ton hydraulic press and a multinozzle oxy-acetylene ring burner. Details of welding procedure and results of mechanical tests on the welds, with and without heat treatment. (To be concluded.)

22d-6. An Important Asset of Magnesium: Weldability. *Magazine of Magnesium,* Feb. 1948, p. 8-11.

Methods for welding magnesium, and practical applications.

For additional annotations indexed in other sections, see:

2b-29; 3b-19; 7a-37; 9b-3; 15b-6-7; 19a-20; 19b-19; 23b-9; 24b-14; 27b-15; 27c-3.



23 APPLICATIONS

23a—General

23a-8. Selection of High-Temperature Materials for Gas Turbines. Rebecca H. Smith. *Iron Age,* v. 161, Jan. 22, 1948, p. 56-60.

Metallurgical and economic factors.

23a-9. Heat Resistant Alloys for Use in Jet Propulsion Engines. J. W. Freeman, E. E. Reynolds and A. E. White. *Journal of the Aeronautical Sciences,* v. 14, Dec. 1947, p. 693-702.

Problems involved in their development for rotor disks and blades, flame tubes, tail pipes, and nozzle assemblies. Alloy types reviewed are: hardenable ferritic steels; austenitic-base alloys; age-hardenable alloys; and precision-cast alloys. Future prospects for development.

23a-10. Permanent Magnets of Sintered Oxides. R. J. Studders. *Product Engineering,* v. 19, Feb. 1948, p. 120-122.

Raw materials are fine oxide powders, minus 200 mesh, and of the type and purity widely used in the ceramic industry. A typical mix consists of 31.0% red ferric oxide, Fe_2O_3, 43.0% black magnetic ferrosoferric oxide, Fe_3O_4, and 26.0% cobaltous oxide, CoO. Fabrication methods, physical and electrical properties; magnetic properties and design data; and effects of heat, vibration, and aging.

23a-11. Roller Bearings for Freight Cars. M. S. Downes. *Railway Age,* v. 124, Feb. 14, 1948, p. 62-63.

Use and operating and maintenance advantages. (Presented at A.S.M.E. annual meeting, Atlantic City, Dec. 4, 1947.)

23a-12. Modern Bearing Materials Meet Tough Demands of Diesel Service Conditions. *Power,* v. 92, Feb. 1948, p. 74-77.

Selection of bearing materials, especially as affected by introduction of new alloys and combinations of metals.

23a-13. Structural Materials. *Aircraft Production* v. 10, Feb. 1948, p. 42-43.

Brief notes on the use and properties of high-grade steels and light alloys in large aircraft.

23b—Ferrous

23b-9. Development of a Successful Hard-Surfaced Bit for Drilling Oil Shale. Tell Ertl, John R. Wagner, Jr., and Ernest E. Burgh. *Bureau of Mines, Report of Investigations* 4177. Jan. 1948, 8 pages.

Design of bits and method used for hard surfacing. The material used was "acetylene tube borium" manufactured by Stoody Co. It consists of steel tubes containing accurately sized particles of cast tungsten carbide. The resulting bits showed excellent wear properties in oil shale.

23b-10. Radiant Heating With Steel Cable. Reuben S. Tice. *Western Metals,* v. 6, Jan. 1948, p. 46-47.

Unique system in which steel cable coated with zinc, and laid between the floor beams or embedded in concrete, serves as a resistance network for heating purposes. The current supplied is low-voltage and high-amperage and operates at about 110° F. to produce floor temperatures of 70 to 74° F.

23b-11. What the User Should Know About Tubing. E. J. DeWitt. *Machinery,* v. 54, Feb. 1948, p. 165-169.

Principal classifications, characteristics, and fabrication of tubes of ferrous materials. (First of two installments.)

23b-12. Body Engineers Hear of Light Automobile Ideas, Study Structures, Materials. *SAE Journal,* v. 56, Feb. 1948, p. 77-78.

Reviews three papers and accompanying discussion devoted to automotive body design and use of low-alloy, high-tensile steels, presented at S.A.E. annnal meeting, Detroit, Jan. 12-16, 1948.

23c—Nonferrous

23c-9. Copper on Large Housing Project. *Sheet Metal Worker,* v. 39, Jan. 1948, p. 101-102.

Varied architectural applications.

23c-10. Uses for Tantalum and Columbium. T. A. Hood. *Munitions Supply Laboratories, Commonwealth of Australia. Information Circular* 11, Sept. 1947, 18 pages.

A brief review followed by a classified list of uses and a selected bibliography. 35 ref.

(Turn to page 54)

Microstructure, Heat Treatment, and Composition Control Toughness of Steels

Reported by Harold W. Schmid

General Metals Corp.

The property of toughness in steels is hard to define and equally hard to evaluate because of the number of variables involved, according to John M. Hodge, research associate in the research and development division of Carnegie-Illinois Steel Corp. "Tough Steels" was the subject of Mr. Hodge's talk presented before the Texas Chapter A.S.M. on Feb. 3.

Using armor plate as an example, he pointed out that toughness here involves the ability of the material to absorb extreme amounts of dynamic energy by plastic deformation. This requires both high strength and extreme ductility and is further influenced by the type of loading encountered, that is, whether axial, biaxial or more complicated forms of loading. Temperature also influences toughness to a marked degree.

Generally speaking, the following metallurgical variables control the toughness of steels: (*a*) microstructure, (*b*) heat treatment, (*c*) composition. Mr. Hodge elaborated on the effect of these variables by a series of charts and graphs illustrating the correlation of hardness and impact values with different microstructures.

The prerequisites of a tough steel were summarized as follows:

1. The microstructure should be full tempered martensite or lower bainite. If limited to pearlitic microstructures, the pearlite should be fine.
2. The hardenability should be sufficient to attain the desired microstructure.
3. The carbon content should be as low as is consistent with the desired strength level and heat treatment.
4. The alloy content and heat treatment should be chosen so as to minimize temper brittleness.

New Movie on Aluminum

The first color motion picture to show the production of aluminum from raw bauxite to finished products has been released by Reynolds Metals Co. Entitled "Pigs and Progress", it begins with the mining of raw bauxite, conversion into alumina, and electrolytic reduction to metallic aluminum. Mill operations are depicted, and fabrication of finished products is illustrated.

The 16-mm. film has a sound track and is available without charge for showing before interested groups. Requests should be addressed to the advertising department of the Reynolds Metals Co., 2000 South 9th St., Louisville 1, Ky.

Barron Completes Survey Of Jap Steel Industry

E. T. BARRON, who retired last July as chief metallurgical engineer of Carnegie-Illinois Steel Corp. after 41 years of service, returned from Japan to the United States the latter part of December. Mr. Barron has completed a five-month survey of the iron and steel industry in that country for Overseas Consultants, Inc.

E. T. Barron

Overseas Consultants consists of a number of leading American engineering firms that have contracted with the U. S. War Department to make an independent engineering survey of Japanese industries. The purpose is to determine the level required to sustain the Japanese economy as of 1950, and to recommend what capacities in the various industries should remain in Japan to support that level and what facilities would be available for reparations. In addition to the iron and steel study, the general survey covers chemical, shipbuilding, oil and power industries. Reports of the survey will likely be used in future peace treaty conferences.

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AMBLER, PENNSYLVANIA

23c-11. The Application of Sintered Carbides in Industry. H. Eckersley. *Engineers' Digest* (American Edition), v. 5, Jan. 1948, p. 22-25. Condensed from *Journal of The Institution of Production Engineers,* v. 26, Oct. 1947, p. 358-377.

23c-12. Present Trends in Nickel Alloys. *Petroleum Engineer,* v. 19, Jan. 1948, p. 106, 108.

23c-13. Carbide Guide-Rest Gives Eight-Fold Increase in Service Life. *Modern Industrial Press,* v. 10, Jan. 1948, p. 8.

Effects of replacement of cast-iron guide-rest in a circular die-roll threader.

23c-14. Why Use Copper Alloys? Malcolm A. Buell. *Canadian Metals & Metallurgical Industries,* v. 11, Jan. 1948, p. 26, 37.

23c-15. Decorative Uses of Copper and Brass. *Copper & Brass Bulletin,* Feb. 1948, p. 1-15.

23c-16. The Application of Hard Materials for Rock Cutting Bits. R. W. Adamson. *Mines Magazine,* v. 38, Jan. 1948, p. 24-28.

Includes a discussion of design, selection, and properties. (To be continued.) (Presented at Annual Metal Mining Convention, El Paso, Texas, Oct. 27, 1947.)

23c-17. That "New Look". *Die Castings,* v. 6, Feb. 1948, p. 35, 51.

Application of aluminum die castings to motor-driven knife sharpener and of nickel-aluminum die castings to a rotating nut sheller.

23c-18. Sulphuric Resistant Stainless Steel Now Available in Wrought Forms. *Modern Machine Shop,* v. 20, Feb. 1948, p. 170, 172, 174, 176.

Characteristics of above.

23d—Light Metals

23d-18. Wire Products in Light Alloy. *Light Metals,* v. 11, Jan. 1948, p. 23-32.

Many new applications of aluminum in wire products.

23d-19. Light Alloy in Rectifiers, Photocells and Condensers. (Continued). *Light Metals,* v. 11, Jan. 1948, p. 33-41.

Compares the production of component containers of plastic, steel, brass, copper, and aluminum and introduces the subject of material specifications.

23d-20. Light Alloys in the Internal Combustion Engine. (Continued.) *Light Metals,* v. 11, Jan. 1948, p. 49-56.

Problems involved in the provision of screwed threads; cylinders and cylinder blocks. (To be cont.)

23d-21. Report on the Use of Elektron Inserts in Synthetic Resin Moldings. C. J. Bushrod. *Magnesium Review and Abstracts,* v. 7, Jan. 1947, p. 18-22.

Cracking and corrosion tests on composite moldings of phenolformaldehyde and cellulose acetate resins containing Elektron (a magnesium alloy) inserts. Good results were obtained.

23d-22. Aluminum Developments in 1947. E. G. West. *Metallurgia,* v. 37, Dec. 1947, p. 91-94.

Concerned mainly with new applications.

23d-23. How to Use Aluminum Roofing Effectively. *Engineering News-Record,* v. 140, Jan. 22, 1948, p. 78-79.

Installation recommendations.

23d-24. Textile Mill Walls Faced With Aluminum. John W. Davis. *Engineering News-Record,* v. 140. Jan. 22, 1948, p. 90-91.

Walls are faced on the exterior with 16-gage aluminum sheets. The roof deck is composed of light-gage steel panels.

23d-25. Magnesium Castings; Production and Use. A. W. Winston and M. E. Brooks. *American Foundryman,* v. 13, Jan. 1948, p. 30-36.

Various applications; methods of production; properties; design factors. (Presented at the Annual Meeting of A.S.M.E., Atlantic City, N. J., Dec. 1-5, 1947.)

23d-26. German Research on Experimental Aluminum-Base Bearings. *British Intelligence Objectives Sub-Committee, FIAT Final Report* No. 805, April 23, 1946, 7 pages.

Production and properties of aluminum base bearings containing Pb and Cd.

23d-27. Beryllium Products. *Industrial Diamond Review,* v. 8, Jan. 1948, p. 20. Abstracted from B.I.O.S. Final Report No. 550, Item No. 21, **Investigation of Beryllium Production in Germany and Italy Including Production and Uses of Oxides and Alloys.** H. M. Stat. Off., London, 1947.

23d-28. Light Cartographic Camera. *Modern Metals,* v. 3, Jan. 1948, p. 22-23.

Uses of aluminum in Fairchild aerial-mapping camera.

23d-29. Aluminum Approved for Air Ducts. *Modern Metals,* v. 3, Jan. 1948, p. 23.

New FHA-approved specifications for air ducts.

23d-30. Reynolds Broadening Aluminum Markets. *Modern Metals,* v. 3, Jan. 1948, p. 30-32.

Numerous new applications introduced or promoted by Reynolds Metals.

23d-31. The Use of Magnesium as a Construction Material in Germany During World War II. Part I. Hubert Altwicker and Ernst Josef deRidder. *Modern Metals,* v. 3, Jan. 1948, p. 15-19.

The state and development of magnesium production in Germany since 1939; the attitude of industry toward the introduction of magnesium; applications of magnesium during the war. (To be continued.)

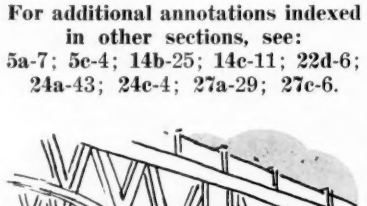
23d-32. Pressed Metal Opportunities for Light Metals. *Light Metal Age,* v. 6, Feb. 1948, p. 12-15.

23d-33. I. C. Builds Five Aluminum Hopper Cars. *Railway Mechanical Engineer,* v. 122, Feb. 1948, p. 90-92.

Described and illustrated. Table gives approximate comparable weights of aluminum and steel parts used.

For additional annotations indexed in other sections, see:

5a-7; 5c-4; 14b-25; 14c-11; 22d-6; 24a-43; 24c-4; 27a-29; 27c-6.



24

DESIGN and STRESS ANALYSIS

24a—General

24a-22. Instability of Simply Supported *Production Engineering & Management,* v. 21, Jan. 1948, p. 49.

Improved method of making templets from lofts.

24a-22 Instability of Simply Supported Square Plate With Reinforced Circular Hole in Edge Compression. Samuel Levy, Ruth M. Woolley, and Wilhelmina D. Kroll. *Journal of Research of the National Bureau of Standards,* v. 39, Dec. 1947, p. 571-577.

A method for computing the compressive buckling load of the above type of plate. Numerical results for six square plates having hole diameters up to one-half the plate length. Comparison with results for plates without holes shows that an unreinforced circular hole causes a relatively small reduction in buckling load, and reinforcement by a doubler plate causes a substantial increase.

24a-23. Tubes in Manufacturing. Edwin Laird Cady. *Scientific American,* v. 178, Feb. 1948, p. 60-62.

Varied uses of tubing as an intermediate step in manufacturing processes, rather than as an end product; for example, races of ball bearings made from tubing and tubular shapes used as design elements in weldments.

24a-24. Formula for Corrected Gears Working at Nonstandard Center Distance. J. Turner. *Machinery* (London), v. 72, Jan. 1, 1948, p. 11-13.

A geometrical and algebraical development.

24a-25. An Improved Photo-Elastic Method for Determining Plane Stresses. C. B. Norris and A. W. Voss. *National Advisory Committee for Aeronautics, Technical Note* No. 1410, Jan. 1948, 43 pages.

Drucker's method is extended by means of an additional oblique photograph, and simpler equations for relating fringe order to principal stresses are derived. The method is considered more accurate than Drucker's use of Stresscoat and was found desirable for greater accuracy in determination of directions of principal stresses.

24a-26. Instability of Outstanding Flanges Simply Supported at one Edge and Reinforced by Bulbs at Other Edge. Stanley Goodman and Evelyn Boyd. *National Advisory Committee for Aeronautics, Technical Note* No. 1433, Dec. 1947, 25 pages.

The compressive buckling stress of outstanding flanges reinforced by bulbs was determined by the torsion-bending theory for flanges having 54 shapes and a range of length. Results are analyzed and an empirical formula for flanges capable of giving the most support without torsional buckling is presented.

24a-27. Performance Tests of Wire Strain Gages. VI. Effect of Temperature on Calibration Factor and Gage Resistance. William R. Campbell. *National Advisory Committee for Aeronautics, Technical Note* No. 1456. Jan. 1948. 25 pages.

Variations with temperature for 15 types of single-element, multi-strand-wire, strain gages. For 13 types, the maxamum difference between room temperature calibration factor and that between −73 and 93° C. did not exceed 4%.

24a-28. Sur le Flambement des Poutres Droites a Section Constante et a Momente d'Inertie Variable. (Yield Strength of Straight Beams of Constant Cross Section and Variable Moments of Inertia.) Florin Vasilisco. *Comptes Rendus* (France), v. 225, Oct. 27, 1947 p. 716-718; Nov. 3, 1947, p. 794-796.

A general method is developed and series of formulas proposed whose application to practical problems was successful. The method is extended to a beam stressed at any point, instead of only at the point of suspension.

24a-29. La Securite des Pieces de Grande Longeur. (The Safety of Very

(Turn to page 56)

NATIONAL MEETINGS *for April*

April 5-8—National Association of Corrosion Engineers. 1948 Conference and Exhibition, Hotel Jefferson, St. Louis, Mo. (W. Z. Friend, N.A.C.E., 67 Wall St., New York 5.)

April 5-8—Third Southern Machinery and Metals Exposition. Municipal Auditorium, Atlanta, Ga. (Michael F. Wiedl, managing director, 267 East Paces Ferry Rd., N. E., Atlanta 5, Ga.)

April 7-9—Illinois Institute of Technology. Tenth Annual Midwest Power Conference, Hotel Sheraton, Chicago. (Stanton E. Winston, conference director, Ill. Inst. of Tech., 3300 South Federal St., Chicago 16.)

April 7-9—American Gas Association. Annual A.G.A. Sales Conference on Industrial and Commercial Gas, Prince Edward Hotel, Windsor, Ont., Canada. (M. A. Combs, secretary, Industrial and Commercial Gas Section, A.G.A., 420 Lexington Ave., New York 17.)

April 7-9—American Society of Civil Engineers. Spring Meeting, William Penn Hotel, Pittsburgh. (A.S.C.E., 33 West 39th St., New York 18.)

April 12-14. American Institute of Mining and Metallurgical Engineers. 31st Annual Conference of the Open Hearth Steel Committee and Coke Oven, Blast Furnace and Raw Materials Committee, Iron and Steel Division, William Penn Hotel, Pittsburgh. (Ernest Kirkendall, secretary, Metals Division, A.I.M.E., 29 West 39th St., New York 18.)

April 14-17—Electrochemical Society. Spring Convention, Deshler-Wallick Hotel, Columbus, Ohio. (R. M. Burns, secretary, 235 West 102nd St., New York 25.)

April 15-16—Metal Powder Association. Fourth Annual Spring Meeting and Exhibit, Drake Hotel, Chicago. (M.P.A., 420 Lexington Ave., New York 17.)

April 15-16—American Zinc Institute. Thirtieth Annual Meeting, Hotel Statler, St. Louis, Mo. (Ernest V. Gent, secretary, 60 East 42nd St., New York 17, N. Y.)

April 19-21 — American Society of Lubrication Engineers. Convention and Exhibition, Buffalo, N. Y.

April 19-23—American Chemical Society. 113th National Meeting, Stevens Hotel, Chicago. (A.C.S., 60 East 42nd St., New York 17.)

April 22-23—Westinghouse Electric Corp. 1948 Machine Tool Forum, Hotel Statler, Buffalo.

April 26-27—Association of Iron and Steel Engineers. Annual Spring Conference, Hotel Statler, Buffalo. (A.I.S.E., 1010 Empire Bldg., Pittsburgh.)

April 25-30—American Ceramic Society. Fiftieth Annual Meeting, Palmer House, Chicago. (Office of the General Secretary, 2525 North High St., Columbus, Ohio.)

April 26-30—American Management Association. 17th Annual Packaging Expositon, Public Auditorium, Cleveland. (Clapp & Poliak, Inc., exposition management, 350 Fifth Ave., New York 1, N. Y.)

Cyclic Annealing Discussed

Reported by Knox A. Powell

Research Engineer
Minneapolis-Moline
Power Implement Co.

Cyclic annealing of carbon and alloy steels was discussed before the Northwest Chapter A.S.M. on Jan. 15 by Peter Payson, assistant director of research for the Crucible Steel Co. of America. A well-chosen series of slides accompanying the talk set forth the theory, practice, and results of time-cycle annealing. A question and answer period following the lecture demonstrated the broad and ready application of the time-temperature-transformation curve data to annealing by temperature cycles. Details of Mr. Payson's talk have been reported in previous issues of *Metals Review*.

RESEARCH AND DEVELOPMENT • POSITIONS

● Senior—Intermediate—Junior level for participation in the program of investigating the application of nuclear energy to the propulsion of aircraft now being carried on at Oak Ridge, Tennessee. Salaries will be commensurate with qualifications.

Inquiries welcomed from

METALLURGISTS • METALLURGICAL and CERAMIC ENGINEERS
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MATHEMATICIANS
AERONAUTICAL and MECHANICAL ENGINEERS
AIRCRAFT POWERPLANT DESIGNERS and ENGINEERS

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Specially commissioned by the Institute of Metals, this book has been written for the older metallurgist whose knowledge of pure physics is insufficient to enable him to come readily to terms with the modern theoretical work on the metallic state. ● The author deals with the new approach to metallurgy, some basic principles of atomic theory, the Bohr theory of the atom, the probability conceptions, applications to metals, the effect of crystal structure, application to alloy structures, approximations involved in the results of the electron theories, insulators and conductors, magnetic properties of metals and alloys, and the cohesion of metals.

This book should be read by every metallurgist.

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Long Pieces). Robert Leve. *Comptes Rendus* (France), v. 225, Nov. 24, 1947, p. 988-990.

Safety factors for very long structural parts are calculated by comparison with the fatigue strength of short ones.

24a-30. Entwicklung und Anwendung der Elektrischen Dehnungsmesser zur Messung von Statischen und Dynamischen Spannungen. (Development and Application of Electrical Extensometer for Measurement of Static and Dynamic Stresses.) A. R. Anderson. *Schweizer Archiv*, v. 13, Nov. 1947, p. 321-326.

Methods for measuring stresses, covering both principles and applications to various problems.

24a-31. Creep Phenomena Under Complex Stress Conditions. (In Russian.) L. M. Kachanov. *Kotloturbostroenie* (Boiler and Turbine Manufacture), Aug. 1947, p. 6-10.

Alterations of deformation and stress per unit of time were studied in a series of problems. For example, the problem of creep of a spherical container and cylindrical tube with thin walls is solved by a very simple method.

24a-32. Antifriction Bearings. Part VI and VII. L. E. Browne. *Steel*, v. 122, Jan. 26, 1948, p. 50-53, 73; Feb. 9, 1948, p. 76-79, 107.

Lubricants and lubricating systems for successful functioning of antifriction bearings. Recent developments in mountings for steel mills, and the importance of correctly designed seals and closures.

24a-33. Progressive Die Design, I. C. W. Hinman. *Modern Machine Shop*, v. 20, Feb. 1948, p. 124-130.

Its application to perforating, drawing, piercing, embossing, and blanking steel escutcheon plates. (To be continued.)

24a-34. Stress Analysis of Noncircular Rings for Monocoque Fuselages. Chi-Teh Wang and S. Ramamritham. *Journal of the Aeronautical Sciences*, v. 14, Dec. 1947, p. 707-712.

Application of the method of least work to analysis of fuselage rings admits two possible sources of computational error. A method that reduces both sources of error; its advantages.

24a-35. Cardboard-Box Wing Structures. F. R. Shanley. *Journal of the Aeronautical Sciences*, v. 14, Dec. 1947, p. 713-715.

Design and testing of structures which consist of two metal sheets joined by a third corrugated sheet, which resembles fiberboard construction. Advantages.

24a-36. The Use of Electrical Strain Gages in Machine Design. W. R. Mehaffey. *Frontier*, Dec. 1947, p. 11-14, 22.

Methods and equipment. 10 ref.

24a-37. Photo-Elasticity. H. T. Jessop. *British Science News*, v. 1, no. 4, 1947, p. 9-12.

Theory and practice of photo-elastic stress analysis.

24a-38. Charts for Calculating Root Stresses in Spur Gears. Wayne H. Bookmiller. *Product Engineering*, v. 19, Feb. 1948, p. 161, 163.

Their derivation explained.

24a-39. Design Charts for Spur and Helical Gears. F. G. Watts. *Machinery* (London), v. 72, Jan. 15, 1948, p. 67-73.

24a-40. Intermeshing Noncircular Algebraic Gears. Clive Temperley. *Engineering*, v. 165, Jan. 16, 1948, p. 49-52.

Details of design calculations.

24a-41. On the Stresses in a Plate Containing Two Circular Holes. Chih-Bing Ling. *Journal of Applied Physics*, v. 19, Jan. 1948, p. 77-82.

A theoretical solution to the problem. Three fundamental stress systems, namely, the all-around tension case, the longitudinal tension case, and the transverse tension case. Formulas for stress along the edges of holes are derived and values of maximum stress are calculated. The limiting case in which the holes are tangential is also discussed.

24a-42. Salient Features of Handwheel Design. H. F. Williams. *Machine and Tool Blue Book*, v. 44, Feb. 1948, p. 169-170, 172, 174, 180, 182, 184, 186-187.

24a-43. Power Plant Men See New Engines Bring New Problems. *SAE Journal*, v. 56, Feb. 1948, p. 79-81.

Reviews seven papers and accompanying discussion devoted to materials and fuels problems brought about by use of higher temperatures in aircraft power plants, presented at S.A.E. annual meeting, Detroit, Jan. 12-16, 1948. Includes stress analysis and design; use of ceramic bodies and coatings; aviation-fuel performance; use of direct injection of fuels; and ramjets for supersonic propulsion.

24a-44. Plastics Design Factors in Transfer-Molding Techniques. Wesley S. Larson. *Electrical Manufacturing*, v. 41, Feb. 1948, p. 96-100, 172, 174, 176.

Advantages and limitations of methods where the design involves molded-in metal inserts or other intricate use of metals in combination with plastics, or calls for delicate mold construction.

24b—Ferrous

24b-10. Report of Committee 30—Impact and Bridge Stresses. *American Railway Engineering Association, Bulletin*, v. 49, Jan. 1948, p. 276-284.

Brief reports on the following subjects: Tests of viaduct columns; tests of steel-girder spans with open and ballasted deck; tests of dynamic shear in steel-girder and truss spans; tests of impact and bending stresses in columns and hangers of steel spans; determination of damping factors of steel spans and the variation in amount of damping with change in loading, by means of tests with an oscillator and model tests; determination of stresses and impacts in timber-stringer bridges; tests of steel-truss spans with open and ballasted deck; distribution of live load in transverse floors and longitudinal stringers; and stresses in lateral bracing of bridges.

24b-11. The Production of Favorable Internal Stresses in Helical Compression Springs by Pre-Stressing. D. G. Sopwith. *Engineers' Digest* (American Edition), v. 4, Dec. 1947, p. 558-560. Condensed from "Advance copy of Papers Presented at Symposium on Internal Stresses in Metals and Alloys", Oct. 1947, p. 195-207. Institute of Metals, London.

Results of an experimental investigation. Favorable internal or residual stresses are introduced by winding the spring somewhat longer than the required length and compressing it several times to closure. Both rectangular and circular-section springs of Si-Mn steel were investigated.

24b-12. Spring Design & Manufacture. John A. Roberts. *Wire Industry*, v. 15, Jan. 1948, p. 43-44, 47.

British research, stress-range testing, and production testing techniques. The design of helical compression springs. (To be continued.)

24b-13. Proper Use of Spring Materials. F. P. Zimmerli. *SAE Quarterly Transactions*, v. 2, Jan. 1948, p. 157-168.

Previously abstracted from preprint. See item 24-236, R.M.L., v. 4, 1947. (Presented at S.A.E. Summer meeting, French Lick, Ind., June 2, 1947.)

24b-14. Weld Engineering Doubles Output—Cuts Cost in Half. *Modern Industrial Press*, v. 10, Jan. 1948, p. 54.

Substitutions of projection welds for spot welds in bus-body pillar made from 13 separate stampings.

24b-15. Photo-Elastic Analysis of Stresses in Crane Ladle Hooks. F. K. Chang, K. E. Knudsen, and Bruce G. Johnston. *Iron and Steel Engineer*, v. 25, Jan. 1948, p. 87-94.

One of the two research programs on ladle hooks being sponsored by the A.I.S.E. tells how to accurately compute bending and direct stresses in hooks.

24b-16. Determination of Compressive Stress Present in Porcelain Enamel on Sheet Iron. E. E. Bryant and M. G. Ammon. *Journal of the American Ceramic Society*, v. 31, Jan. 1, 1948, p. 28-30; discussion, p. 22.

Method consists of preparation of laboratory samples under carefully selected and controlled conditions and measurement of the warpage produced in the sample due to application of enamel on one side. Data obtained by the above method were compared with expansion curves, but failed to produce correlation between expansion as determined on frit samples and compression in the porcelain enamel as indicated by the warp of sample plates. It was concluded that expansion curves on frit samples are not suitable for evaluating compressive stress in the enamel coating.

24b-17. All-Sheet Metal Compressor Housing. *Product Engineering*, v. 19, Feb. 1948, p. 103.

The number of punch-press operations on a hermetically sealed compressor housing were reduced by designing shallower depressions in the housing shell and substituting mounting brackets, projection welded to the housing. Other material and time-saving operations.

24b-18. Ball and Roller Bearings. Bryce T. Ruley. *Product Engineering*, v. 19, Feb. 1948, p. 123-126.

Relative merits of different types of rolling-contact bearings for various operating conditions and considerations of misalignment, friction, deflection, lubrication, and operating speed that affect bearing choice.

24b-19. Flange Design Considerations—Flat and Dished Cover Plates; Flanges With Full-Faced Gaskets. Harald E. Lonngren. *Petroleum Refiner*, v. 27, Feb. 1948, p. 90-93.

24b-20. Testing of Highway Bridges. N. Davey. *Engineering*, v. 165, Jan. 23, 1948, p. 93-95.

Work of British Building Research Station especially on bridges of the cast-iron-girder and masonry-arch type up to about 40-ft. span. Certain bridges were tested to destruction by means of hydraulic jacks, using extensive instrumentation to determine deflections, stresses, and strains at each stage. On others, stresses and strains were measured under various loads customarily encountered in service. Future research is outlined.

24b-21. The Behavior of Webs of Plate Girders. S. R. Sparkes. *Welding Research*, v. 1 (Bound with *Transactions of the Institute of Welding*, v. 10), Dec. 1947, p. 4-17.

An extensive theoretical and experimental study made to define safe and economical design limits. Details of procedure and results. 10 ref.

24c—Nonferrous

24c-3. Adjustment Pays Off. Max Boehm. *Die Castings*, v. 6, Feb. 1948, p. 23, 43-44.

(Turn to page 58)

CHAPTER MEETING CALENDAR

CHAPTER	DATE	PLACE	SPEAKER	SUBJECT
Akron	Apr. 14	Elks Club	Kent R. Van Horn	Aluminum and Its Alloys
Baltimore	Apr. 19	Engineers Club	Jack T. Wilson	Industrial Application of High-Energy Electron Accelerators
Boston	Apr. 2	Hotel Sheraton	James B. Austin	Sauveur Memorial Lecture
Calumet	Apr. 13	Phil Smidt & Sons, Hammond, Ind.	Robert H. Aborn	Metallurgy of Welding
Cedar Rapids	Apr. 13	Hotel Roosevelt	D. C. Smith	Arc Welding Electrode Coatings and Their Effect on Welding
Chicago	Apr. 12	Furniture Mart Club Rooms	Harold J. Babcock	Heat Treating With Modern Salt Baths
Cincinnati	Apr. 8	Engineering Society		Nondestructive Testing (Tri-Chapter Meeting)
Cleveland	Apr. 5	Cleveland Club	C. E. Heussner	Properties of Surface Coatings
Columbus	Apr. 8	Cincinnati		Nondestructive Testing (Tri-Chapter Meeting)
Dayton	Apr. 8	Cincinnati		Nondestructive Testing (Tri-Chapter Meeting)
Des Moines	Apr. 13	Younkers Tearoom	W. H. Bornstein	Engineering Materials & Their Application
Detroit	Apr. 12	Engineering Society of Detroit	D. A. Nemser	The Effect of Structure on Machining of Steels
Eastern N. Y.	Apr. 13	Circle Inn, Latham, N. Y.	W. Trinks	Hot Rolling
Fort Wayne	Apr. 12	Chamber of Commerce	A. E. Focke	Physical Properties and Heat Treatment
Georgia	Apr. 5	Scripto Mfg. Co.	J. Sherman Smith	From Metal to Pencils
Georgia	Apr. 12	Atlantic Steel Co.	Kenneth Matticks	Stainless Steel—Its Manufacture and Uses
Hartford	Apr. 13		G. A. Waterman	Applications of Copper-Base Alloys
Indianapolis	Apr. 19		G. M. Rollason	Aluminum Die Castings
Lehigh Valley	Apr. 2	Hotel Traylor, Allentown, Pa.	H. B. Knowlton	Properties and Performance of Steel
Los Alamos	Apr. 5		Herbert Isenburger	Industrial Radiology
Los Angeles	Apr. 22		Paul P. Zeigler	Heat Treatment and Fatigue Qualities of Light Alloys
Mahoning Valley	Apr. 20	V. F. W. Rooms, Youngstown, Ohio	Harry K. Ihrig	Hot Workability
Milwaukee	Apr. 20	City Club	L. F. Yntema	The Metallurgy of Unusual Metals
Montreal	Apr. 5	Queen's Hotel	Francis B. Foley	Heavy Forgings
Muncie	Apr. 20	Muncie Central High School	Richard D. Chapman	Heat Treatment
New Haven	Apr. 15	Hotel Barnum, Bridgeport, Conn.	E. E. Thum	Implications of Atomic Energy
New Jersey	Apr. 19	Essex House, Newark	S. Skowronski	Copper and Copper Alloys
New York	Apr. 12	Building Trades Club	J. C. Fox	Die Casting
			J. W. Wheeler	Permanent Mold Casting
North West	Apr. 15	Covered Wagon, Minneapolis	V. N. Krivobok	The Fabrication of Stainless Steels
Northwestern Pa.	Apr. 22	Warren, Pa.		Nonferrous Metallurgy
Notre Dame	Apr. 14	Engineering Audit., Univ. of Notre Dame	R. B. DeLano	The Supersonic Reflectoscope
Oak Ridge	Apr. 14	Norristown Restaurant, Norris, Tenn.		Movies of Fontana Dam and T. V. A.
Ontario	Apr. 2	Royal York Hotel, Toronto	John R. Harbaugh	Toolsteels and Toolsteel Failures
Ottawa Valley	Apr. 6	Bureau of Mines	Francis B. Foley	Steels
Penn State	Apr. 13	Mineral Industries Bldg.	W. T. Lankford	Fracture of Metals
Philadelphia	Apr. 30	Engineers Club	George A. Roberts	Toolsteels
Pittsburgh	Apr. 8	Mellon Institute	A. L. Feild	New Corrosion and Heat Resistant Metals
Pueblo	Apr. 15	Minnequa Club	Charles Bryant	Wrought Steel Wheels
Purdue	Apr. 20	Aluminum Co. of America	R. L. Templin	Determination and Significance of Mechanical Tests of Metals
Rhode Island	Apr. 6			
Rochester	Apr. 12	Lower Strong	Kent R. Van Horn	Industrial Applications of Aluminum Alloys
Rocky Mountain	Apr. 16	Oxford Hotel, Denver	Charles Bryant	Wrought Steel Wheels
Saginaw	Apr. 20	Fischer's Hotel, Frankenmuth, Mich.	John C. Straub	Shot-Peening
St. Louis	Apr. 15	Mineral Springs Hotel, Alton, Ill.	Sam Hoyt	German Nonferrous Research During the War
Southern Tier	Apr. 12	Hotel Frederick, Endicott, N. Y.	F. G. Tatnall	Physical Testing
Springfield	Apr. 19	Hotel Weldon, Greenfield, Mass.	Hans Ernst	Metal Cutting Research
Syracuse	Apr. 6	Onondaga Hotel	R. M. Brick	Metals at Very Low Temperatures
Texas	Apr. 6	Ben Milam Hotel, Houston	V. N. Krivobok	Stainless Steel Production Problems
Terre Haute	Apr. 12	Indiana State Teacher's College Student Union	J. T. Beard	Some of the Practical Aspects of Tool Wear
Toledo	Apr. 22	Maumee River Yacht Club	W. J. Phillips	Research and Development in the Steel Casting Industry
Tulsa	Apr.		J. J. B. Rutherford	Alloy and Stainless Steel Tubing
Washington	Apr. 12	Dodge Hotel, Garden House	R. F. Mehl	Radioactive Tracers in Metallurgical Research
Western Ontario	Apr. 9		G. W. Watts	Latest Developments in Abrasives
Wichita	Apr. 15	Broadview Hotel	W. F. Ross	Industrial Heating Furnace Equipment
Worcester	Apr. 14	Marlboro Country Club	Henry Stenberg	Foundry Practices
York	Apr. 14	Harrisburg, Pa.	George D. Slottman	Oxygen in the Openhearth

How a small subassembly, for many years made of brass tubing and a steel cam, is now die cast in zinc, saving $7 per thousand pieces.

24c-4. Sparking Sales. *Die Castings,* v. 6, Feb. 1948, p. 24-26, 45-49.

Construction of spark-plug cleaner and tester, built to withstand pressures up to 300 psi., almost entirely of zinc die castings.

24c-5. Design of a Magnetic Jig Saw. *Die Castings,* v. 6, Feb. 1948, p. 27-28, 49-51.

Adjustment of each unit was a bottleneck in this assembly line until zinc die castings provided a means for precision assembling. In redesigning, the total number of parts was reduced from 41 to 24.

24d—Light Metals

24d-2. Determination of Plate Compressive Strengths. George J. Heimerl. *National Advisory Committee for Aeronautics, Technical Note* No. 1480, Dec. 1947, 19 pages.

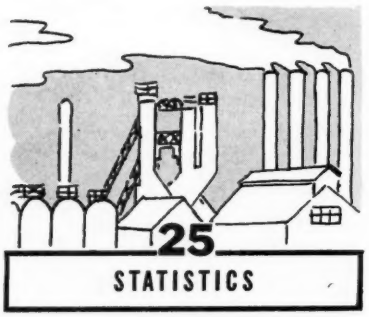
Results of local-instability tests of H, Z, and C-section plate assemblies of four extruded aluminum alloys and two magnesium alloys. On the basis of the general relationships found between plate compressive strengths and compressive stress-and compressive stress-strain curves, methods applicable to flat plates and based upon the use of the compressive stress-strain curve are suggested for determining the critical compressive stress and the average stress at maximum load.

24d-3. Methods for Determination of Corrosion Resistance of Light Alloys Under Stress. (In Russian.) S. E. Pavlov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 13, Oct. 1947, p. 1234-1244.

Methods used in the U.S.S.R. and elsewhere, the different test apparatuses and methods, and the results obtained. 11 ref.

For additional annotations indexed in other sections, see:

3b-15-16-20; 9a-11; 9b-5; 19a-19; 20a-68; 22a-33; 27a-23-27.



25a—General

25a-17. Special Machinery Output Accelerating. Howard C. Tuttle. *Steel,* v. 122, Jan. 26, 1948, p. 32-33, 119-120.

Present situation and future prospects.

25a-18. American Machinist's 1948 Appraisal of Metalworking, With a Statistical Summary. *American Machinist,* v. 92, Jan. 29, 1948, p. 105-120.

Data on production, materials, exports, wages, and prices.

25a-19. American Machinist Index of Metalworking Production. *American Machinist,* v. 92, Jan. 29, 1948, p. 121-126.

Month-to-month variations since Jan. 1935. Figures were obtained by use of manhours adjusted for changes in productivity.

25a-20. Metal Mining in Colorado in 1947. *Skillings Mining Review,* v. 36, Jan. 31, 1948, p. 1, 4.

A statistical review.

25a-21. Metal Mining in the Eastern States in 1947. *Skillings Mining Review,* v. 36, Jan. 31, 1948, p. 6, 10-11.

A statistical review.

25a-22. 30 Roku Sovetského Slévarenstvi. (30 Years in the Soviet Foundry Industry.) Jiri Alexandrovsky. *Hutnické Listy* (Metallurgical Topics), v. 2, no. 5, 1947, p. 97-99.

Technical and economic progress.

25a-23. Metalworking Industries Operate at Record Peacetime Level. H. McLeod. *Canadian Metals & Metallurgical Industries,* v. 11, Jan. 1948, p. 15-21, 32.

Canadian statistics covering 10-year period.

25a-24. Mineral Economics. Elmer W. Pehrson. *Mining and Metallurgy,* v. 29, Feb. 1948, p. 66-70.

Annual review.

25a-25. Mining Developments Throughout the World. Philip J. Shenon. *Mining and Metallurgy,* v. 29, Feb. 1948, p. 71-75.

Annual review.

25a-26. What Leaders Say About 1948 Prospects. *Industry and Power,* v. 54, Feb. 1948, p. 100, 110.

Brief summaries of the 1947 achievements of such basic industries as power, coal, oil, steel, aluminum, and nickel.

25a-27. Metals Review and Forecast. *Engineering and Mining Journal,* v. 149, Feb. 1948, p. 71-95.

Economic review and forecast consists of the following sections: Gold; Silver, by Dickson H. Leavens; Copper, by H. H. Wanders; Zinc, by Charles R. Ince; Lead, by Robert Lindley Ziegfeld; Tin, by J. C. Johnson; Aluminum, by R. J. Lund and C. M. Craighead; Magnesium, Minor Metals, by Charles White Merrill; Antimony, Arsenic, Bismuth, and Cadmium (separate articles), by Richard H. Mote; Beryllium, by Allan F. Matthews; Cobalt, Nickel, Vanadium, Tungsten, and Molybdenum (separate articles), by Hubert W. Davis; Mercury and Titanium (separate articles), by Helena M. Meyer; Ferro-Alloy Metals, by Charles White Merrill; Chromite and Manganese (separate articles), by Norwood B. Melcher; and Nonmetallics, by G. Richards Givinn and William H. Waggaman. Charts and tables showing average metal prices, 1897-1947.

25a-28. The Iron Age Metalworking Buyers' Guide. *Iron Age,* v. 161, Jan. 22, 1948, p. 70-72, 120; Jan. 29, 1948, p. 77-78, 123-127; Feb. 5, 1948, p. 128, 130, 163-167; Feb. 12, 1948, p. 122-124, 126, 129-131; Feb. 19, 1948, p. 125-126, 128, 130, 132-134.

Continues alphabetical buyers' guide. Begins with "Brakes, press, hand-operated, precision". Ends with "Counterbores". (To be continued.)

25a-29. Estimating the Cost of Die Casting. James L. Erickson. *Light Metal Age,* v. 6, Feb. 1948, p. 6-11.

25b—Ferrous

25b-16. Iron Ore in 1947. *Skillings Mining Review,* v. 36, Jan. 24, 1948, p. 1, 4.

Production statistics.

25b-17. Scrap Supply to Continue Tight. *Steel,* v. 122, Jan. 26, 1948, p. 26-27, 119.

Prospects for iron and steel scrap.

25b-18. Iron Ore. Norwood B. Melcher. *1946 Bureau of Mines Minerals Yearbook Preprint,* 26 pages.

U. S. and foreign statistics.

25b-19. Iron and Steel Scrap. Norwood B. Melcher and James E. Larkin. *1946 Bureau of Mines Minerals Yearbook Preprint,* 23 pages.

U.S. and foreign statistics.

25b-20. Steel Expansion in Overseas Countries Still in Talking Stage. *Iron Age,* v. 161, Jan. 29, 1948, p. 111-112.

Present status and future prospects.

25b-21. The Modern Coke Plant. T. J. Ess. *Iron and Steel Engineer,* v. 25, Jan. 1948, p. C3-C37.

Monograph includes statistics on effects of coal properties on resulting coke and byproducts, on coal and coke handling, and U. S. steel industry coke plants.

25b-22. Steel Industry's Production in 1947 Sets Peacetime Record. Walter S. Tower. *Blast Furnace and Steel Plant,* v. 36, Jan. 1948, p. 45-48, 56.

Statistical.

25b-23. 1947 Iron Ore Review. M. D. Harbaugh. *Blast Furnace and Steel Plant,* v. 36, Jan. 1948, p. 49-53, 113.

Statistical.

25b-24. Supply of Scrap in 1948 to be Equal to, or Greater Than, Supply in 1947. Edward C. Barringer. *Blast Furnace and Steel Plant,* v. 36, Jan. 1948, p. 89-90.

Amounts available from various sources are forecast.

25b-25. Western Metals Forum. *Western Metals,* v. 6, Jan. 1948, p. 15-20.

The question: "In your opinion as a westerner, is the present basing-point system equitable to steel consumers of the western states?" is discussed by the following; Clark B. Carpenter, J. C. Niemeyer, A. M. Mears, W. L. Wilkinson, Louis B. Lundborg, J. Lester Perry, L. A. Johnson, Morris B. Pendleton, John B. Rauen, Maurice W. Lee, Samuel Moment, and Robert G. Seymour.

25b-26. Grades of L. S. Iron Ore Shipped by Lake in 1947. *Skillings Mining Review,* v. 36, Feb. 7, 1948, p. 1-2.

Grades of iron ore and amounts of each, by companies, shipped from the eight Lake Superior iron ranges during the 1947 shipping season.

25b-27. World Steel Output Rises. *Steel,* v. 122, Feb. 9, 1948, p. 56.

Statistics.

25b-28. Eastern Magnetite. J. R. Linney. *Mining and Metallurgy,* v. 29, Feb. 1948, p. 93-94.

Production data.

25b-29. Ferro-Alloy Metals. R. G. Knickerbocker. *Mining and Metallurgy,* v. 29, Feb. 1948, p. 109-110.

1947 developments, both economic and technical.

25c—Nonferrous

25c-6. The Mineral Industry of Alaska. Alfred L. Ransome. *1946 Bureau of Mines Minerals Yearbook Preprint,* 12 pages.

A statistical review, 25 ref.

25c-7. Nevada Gold, Silver, Copper, Lead, and Zinc (Mine Report). Alfred L. Ransome. *1946 Bureau of Mines Minerals Yearbook Preprint,* 22 pages.

A statistical report.

25c-8. Idaho Gold, Silver, Copper, Lead, and Zinc (Mine Report). C. E. Needham and Paul Luff. *1946 Bureau of Mines Minerals Yearbook Preprint,* 26 pages.

A statistical report.

25c-9. Antimony. Richard H. Mote. *1946 Bureau of Mines Minerals Yearbook Preprint,* 9 pages.

U. S. and foreign statistics.

25c-10. Light at Last on Russia's Metals Position. *Metal Bulletin,* Jan. 9, 1948, p. 7-8.

Some information on nonferrous metals production.

25c-11. The Outlook for the Metal Markets. Joseph Zimmerman. *Mining and*

(Turn to page 60)

EMPLOYMENT SERVICE BUREAU

The Employment Service Bureau is operated as a service to members of the American Society for Metals and no charge is made for advertising insertions. The "Positions Wanted" column, however, is restricted to members in good standing of the A.S.M. Ads are limited to 50 words and only one insertion of any one ad. Address answers care of A.S.M., 7301 Euclid Ave., Cleveland 3, Ohio, unless otherwise stated.

POSITIONS OPEN

East

NUMEROUS ENGINEERING OPENINGS: At Silver Spring, Maryland, for Kellex Corp. Aeronautical engineers, electrical engineers, electronic engineers, physicists, technical writers and first class toolmaker are among 20 some openings listed by above company. Write Kellex Corp., 233 Broadway, New York 17, N. Y.

PROCESS ENGINEERS: With at least three years' metallurgical or chemical experience needed for quality control work. Degree desirable. Write to Employment Office, Chance Vought Aircraft Corp., Stratford, Conn.

GRADUATE ENGINEER: At least five years' experience in metallurgical engineering, particularly in the nonferrous field. Must have thorough working knowledge of wrought and cast aluminum, magnesium, copper, nickel, and other nonferrous metals and related processes of casting and heat treatment. Will act as consultant to product and design engineers, solve production problems and set standards and specifications. Box 3-130.

Midwest

CHIEF METALLURGIST: Prefer Ph.D. over 35 with established record of research. Must organize and direct new department with work in physical metallurgy, corrosion, welding and nonmetallic materials. Opportunity to do basic research in addition to regular industrial work. Location in Chicago. Salary open. All replies considered strictly confidential. Box 3-5.

WELDING RESEARCH ENGINEER: Must be well trained in experimental welding techniques to carry out research program in improving welding methods used in chemical industry. Prefer man with metallurgical background. Location Chicago. Salary dependent on training and experience. All replies will be considered confidential. Box 3-10.

GRADUATE ASSISTANTS: Each to assist in one of several laboratories—heat treating, welding, casting, radiography, diffraction, metallography, physical testing, mechanical testing, powder metallurgy—half or one third of the time. Write Department of Metallurgical Engineering, Illinois Institute of Technology, Chicago 16, Ill.

METALLURGIST OR METALLURGICAL ENGINEER: For development and application work in casting field. Excellent opportunity for rapid advancement for the right man. Box 3-15

CHEMICAL ENGINEER: Preferably one with experience with ceramics. Unusual opportunity for rapid advancement. Box 3-20.

SALES ENGINEER: Large aluminum manufacturer requires competent engineer in Louisville, Ky., area. Will act in technical advisory capacity in sale of aluminum extruded products, involving considerable customer contact. Require man thoroughly trained in nonferrous metallurgy and experience in the extrusion of metals. In letter, give complete information on age, education, experience and salary required. Box 3-135.

METALLURGISTS: Research and development. Excellent opportunities for young metallurgists, 30 years of age and under, with B.S. in metallurgical engineering. Vacancy exists in pure research on vacuum melted alloys. Others include positions in the studies of alloys for use at extremely low and high temperatures. Babcock & Wilcox Research & Development Department, Alliance, Ohio.

METALLURGIST: With good mechanical knowledge, able to apply the principles of sound metallurgical practices to specific applications on machine tools. Should be familiar with latest type of heat treating equipment, and have experience in flame and induction hardening procedures. Box 3-140.

Southwest

WANTED: By large manufacturing plant with press and hammer forge shop, metallurgical engineer with some executive experience. Experience with large forgings desirable but not necessary. Box 3-145.

West

SALES REPRESENTATIVES: For Portland, Ore., Seattle, Wash., Denver, Colo., and Salt Lake City, Utah, by large producer of seamless and welded stainless, alloy, and carbon steel tubing. Organizations already selling steel commodities or applicants with steel commodity sales experience desired. Box 3-25.

Positions Wanted

INSPECTOR: For 15 years inspector of materials, tests and expediting materials for railroad, 4 years of experience in manufacture of cast iron materials and plumbing goods, 14 years with U. S. Navy Inspection Service supervising inspection work, tests and expediting materials. Prefers position in Milwaukee, Wis. Box 3-30.

METALLURGICAL ENGINEER: B.S. degree, with 10 years experience in ferrous and nonferrous fields. Desires position as materials engineer. Experience includes research and manufacture of alloy steels, copper alloys and some plastics, as well as aircraft metallurgical supervisor and contact metallurgist. Excellent references. Resumé available. Location immaterial. Box 3-35.

METALLURGICAL ENGINEER. Graduating in April 1948 from Canadian university. Age 27, married. Desires position in metallurgy, preferably in the United States. Available May 1, 1948. Box 3-40.

METALLURGICAL ENGINEER: Age 31, married, one child. Graduating with B. Met. Eng. from University of Minnesota in June 1948. Experience includes 1½ years in metallurgical department of steel plant, six years in theater operation, three years in Army Air Corps. Desires permanent position in ferrous production or development. Prefers Midwest. Box 3-45.

PYROMETRY SUPERVISOR: Desires position helping to organize instrument department. Has over 10 years experience in servicing and maintaining pyrometers and accessory equipment. Will consider other openings in pyrometry field. Box 3-50.

STEEL SALES SERVICE, PURCHASING, OR MANAGEMENT: Chemical, metallurgical engineer with 25 years' industrial experience. Available immediately. Location preferably northern Ohio. Box 3-55.

METALLURGICAL ENGINEER: B.S. in Met. Eng., Michigan State College, 1940. Five years trouble shooter relating to heat treatment, welding, forging, casting, stamping and machining of ferrous and nonferrous alloys. Three years research work in precision cast (lost-wax) ferrous and nonferrous metals. Two years plant manager of ferrous and nonferrous precision cast plant. Box 3-60.

METALLURGIST—CHEMIST: Undergraduate, young woman. Administrative type, adaptable. Active member in engineering societies. Several years volunteer and paid applied engineering—industrial and research. Some spectroscopy, photography, drafting, and reports. Will travel, train, study. Copy of record available. Box 3-65.

METALLURGICAL ENGINEER: Age 27, married, veteran U.S.O.R.C. Graduating in May 1948 with B. Eng. (Met.) from McGill University. Some experience in gold mining and steel production. Desires position anywhere with future. Available June 10, 1948. Box 3-70.

PHYSICAL METALLURGIST: Age 31, married, children. Eight years' experience under noted metallurgist in laboratory of firm famous for a wide range of low and high-alloy steel products. Considerable experience in development of gas turbine and other heat resistant alloys. Desires responsible metallurgical position in Philadelphia area. Box 3-75.

METALLURGICAL ENGINEER: B.S. in ferrous metallurgy including control of development and research work, physical and metallographic testing of metals, development of high-temperature alloys and carbon steels, research in heat treatment, alloying and casting by lost-wax process and foundry investigation of field complaints, sales engineering. Desires managership of manufacturing concern, teaching position or metallurgical engineering. Box 3-80.

METALLURGIST: B. Met. Eng. Age 34, single. Diversified industrial experience including openhearth and electric furnace steelmaking. Desires position in development, control, or production in ferrous field. Box 3-85.

METALLURGICAL ENGINEER: B.S. in metallurgical engineering from Case Institute of Technology, M. Met. Eng. from R.P.I. Three years' experience in production and development of molybdenum and tungsten alloys and manufacturing processes for same; 2½ years in light alloy research. Offers diverse training and experience plus ability to get along with others, for manufacturing position with future in management. Any location. Will travel. Box 3-90.

METALLURGICAL ENGINEER: B.S. in metallurgical engineering and industrial administration. Eleven years of varied experience in heat treatment, metallography, materials testing, stress measurements, welding, office management, and gray and malleable iron metallurgy and foundry practice. Desires responsible position in production, research, or sales. Box 3-95.

MANAGER OF SALES AND TECHNICAL SERVICE: Of metal manufacturing company; wide experience in both ferrous and nonferrous metals. Outstanding record of increasing business from old customers, developing new customers for existing applications, and emphasis on developing new applications for both heavy and light metals in all forms. Experience in all phases of selling—direct, through distributors, warehousing, market research, merchandising, advertising — preparation of technical literature and supervision of technical service. Box 3-100.

NONFERROUS METALLURGICAL ENGINEER: Five years' experience in progressive zinc smelting in process development, research, and troubleshooting. Desires position in nonferrous process development, efficient application of products to customers' needs, or electrochemical work. Age 27, married. Box 3-105.

METALLURGICAL ENGINEER: B. Met. Eng. with 4½ years' varied experience—ferrous and nonferrous, heat treating, machine shop, steel rolling mill, parts failure survey, quality control, some supervisory work. Desires position as materials or methods engineer, metallurgist or technical sales in Michigan or Ohio areas. Good at meeting people. Box 3-110.

METALLURGIST: Chemical engineer, M.S. in metallurgical engineering. Now laboratory director and chief metallurgist but wishes responsible position in Midwest. Thirteen years' experience in heat treatment, forging, foundry work, metal fabrication, welding and machining of ferrous and nonferrous metals. Able administrator, production minded. Publications. Professional registered engineer. Box 3-115.

METALLURGICAL TECHNICIAN: Recent graduate of University of Wisconsin. Interested in corrosion and X-ray spectrographic work. Training in metallurgical laboratory work and foundry. Box 3-120.

METALLURGICAL ENGINEER: B.S. in metallurgical engineering. Age 30. Employed as materials engineer. Experienced administrator in ferrous and nonferrous development of materials and processes leading to lower costs and improved performance. Familiar with metal specifications. Available to firm manufacturing or fabricating metals where enterprise, initiative, technical ability are required. Minimum salary $4800. Box 3-125.

METALLURGICAL ENGINEER: B.S. in metallurgical enginecring. Five years' experience in automotive industry as materials and metallurgical engineer. "Stresscoat" stress analysis experience. Understands statistical analysis. Experienced at trouble shooting in the shop. Age 29, married. Box 3-150.

METALLURGIST: B.S. and M.S. in metallurgical engineering. Three years of diversified research experience, one year of openhearth experience. Desires position in production or applied research. Veteran. Age 26. Will consider any location for the right position. Box 3-155.

Metallurgical Society of America, Bulletin No. 282, v. 40, Dec. 1947, p. 45-54; discussion, p. 54-55.

Statistics and economic factors influencing world-wide uses of copper, lead, zinc, and other nonferrous metals.

25c-12. Outlook Promising for Copper Industry for New Year; Says 21.50c Price is Reasonable. *Metals*, v. 18, Jan. 1948, p. 9-10.

Believes price control or government allocation of metal would be catastrophic; urges caution in stockpiling program. An interview with Louis S. Cates.

25c-13. Sees Bright Prospects for Lead During Current Year. Irwin H. Cornell. *Metals*, v. 18, Jan. 1948, p. 11-12.

25c-14. Finds This Year's Outlook Promising in Copper and Brass Fabricating Industry. C. Donald Dallas. *Metals*, v. 18, Jan. 1948, p. 13-14.

25c15. Titanium and Zirconium; Metals of Industrial Promise. William H. Waggaman and Edwin A. Gee. *Chemical and Engineering News*, v. 26, Feb. 9, 1948, p. 377-381.

Discusses the U. S. strategic situation with regard to metals and points out that Ti and Zr are "rare", not because of actual scarcity, but because of difficulties in extraction. Nonmetallic uses; unsolved metallurgical problems; properties; manufacturing procedures; and present and potential uses. 11 ref.

25c-16. Metal Mining in New Mexico in 1947. *Skillings Mining Review*, v. 33, Feb. 7, 1948, p. 6-7.

Information and statistics.

25c-17. Metal Mining in Central States in 1947. *Skillings Mining Review*, v. 36, Jan. 24, 1948, p. 6, 10, 14-15.

Production statistics.

25d—Light Metals

25d-2. Magnesium. C. E. Nighman and Mary E. Trought. *1946 Bureau of Mines Minerals Yearbook Preprint*, 12 pages.

U. S. and foreign statistics. Also reviews technical developments. 16 ref.

25d-3. Bauxite. Hubert W. Davis and Mary E. Trought. *1946 Bureau of Mines Minerals Yearbook Preprint*, 13 pages.

U. S. and foreign statistics.

25d-4. Soviet Russia's Aluminum Totals. *Chemical Age*, v. 58, Jan. 17, 1948, p. 98. Based on article in *Revue d'Aluminium*.

Statistics and information concerning plant locations and capacities.

25d-5. 1947 Aluminum Record. Roy A. Hunt. *Western Metals*, v. 6, Jan. 1948, p. 29.

Production, supplies, and future prospects.

25d-6. The Economic Status of Magnesium. J. D. Hanawalt. *Modern Metals*, v. 3, Jan. 1948, p. 24-28.

Magnesium is now in "phase 4" since the end of the war. Sales are currently increasing, the growth is gradual, and applications are sound. Some of the reasons why a relatively new material goes through such phases. Major outlets.

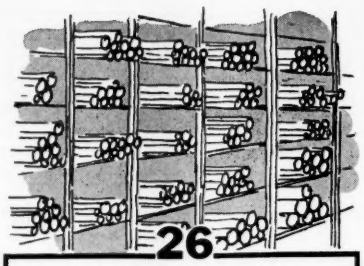
25d-7. 1948 Should Prove Another Good Year for Aluminum Industry With Market Expanding. Arthur V. Davis. *Metals*, v. 18, Jan. 1948, p. 6-7.

25d-8. Aluminum and Magnesium. John D. Sullivan. *Mining and Metallurgy*, v. 29, Feb. 1948, p. 99-101.

1947 technical developments. Production and consumption data and information on new applications.

For additional annotations indexed in other sections, see:

1b-4; 2b-13; 23d-31; 27b-11.



26 MISCELLANEOUS

26a—General

26a-14. Annual Engineering Review. *Materials & Methods*, v. 27, Jan. 1948, p. 87-106.

Divided into the following sections: Trends in materials and their processing; irons and steels; nonferrous metals; plastics; other nonmetallic materials; fabricated materials and precision parts; finishes and coatings.

26a-15. Tracers in Metallurgy. Julius J. Harwood. *Nucleonics*, v. 2, Jan. 1948, p. 57-61.

Use of radioactive tracer techniques as applied to metallurgical problems by two university laboratories. The major study was that of diffusion processes in the solid and liquid states.

26a-16. Ultrasonics: Magic Wand in Production. *Modern Industry*, v. 15, Jan. 15, 1948, p. 50-53.

Review of varied industrial uses.

26a-17. The Design of Radiochemical Laboratories. Henri A. Levy. *Atomic Energy Commission*, MDDC-262, Aug. 20, 1946, 15 pages.

Facilities, equipment, and precautions necessary for work at three levels of radioactivity. A chart shows the approximate range of radioactivity encountered in various research problems. Study of the information presented should lead to more widespread application of radioisotopes.

26a-18. Metallurgy in America, 1917-1947. *Metal Progress*, v. 53, Jan. 1948, p. 75-78.

Important metallurgical events during the past 30 years, listed chronologically.

26a-19. The Study of Diamonds for Industrial Use. H. D. H. Drane. *Research*, v. 1, Jan. 1948, p. 150-158.

Fundamental information and its application to industrial uses, especially in abrasive finishing.

26a-20. Economic Considerations in Industrial Ultrasonics. S. Young White. *Audio Engineering*, v. 32, Jan. 1948, p. 31-32, 47.

Factors of importance in application of ultrasonics to commercial processes.

26a-21. Engineering Developments in 1947. Harold Schor, editor. *Product Engineering*, v. 19, Feb. 1948, p. 81-86.

New applications and improvements of high-temperature materials; use of rare metals; aviation turbines, jets, and rockets; railway shock absorbers; motors; testing and measuring; production techniques; and nucleonics.

26a-22. Materials Experts Explore Greater Economy. *SAE Journal*, v. 56, Feb. 1948, p. 76-77.

Reviews five papers and accompanying discussion, devoted to automotive materials, presented at S.A.E. annual meeting, Detroit, Jan. 12-16, 1948.

26a-23. Metallurgy and Atomic Energy. C. Hubert Plant. *Metallurgia*, v. 37, Jan. 1948, p. 137-140.

In second of series, attention is directed to a consideration of the nucleus of the atom (To be continued.)

26b—Ferrous

26b-3. Developments in Alloy and Special Steels. C. Sykes. *Metallurgia*, v. 37, Dec. 1947, p. 75-79.

Reviews developments under the following headings: heat resisting steel; the overheating of steel; hardenability; hydrogen and hair-line cracks; machinability. 14 ref.

26b-4. 1947 Steelmaking Progress. *Western Metals*, v. 6, Jan. 1948, p. 48-50.

Metallurgical and technical developments at Columbia Steel, Geneva Steel, and other U. S. Steel Subsidiaries.

26b-5. Developments in the Iron and Steel Industry During 1947. I. E. Madsen. *Iron and Steel Engineer*, v. 25, Jan. 1948, p. 46-68.

General introduction; blast furnaces; steelmaking; rolling; finishing; furnaces and controls; materials handling; mechanical developments; electrical developments.

26b-6. Electrical Developments in the Steel Industry During 1947. H. W. Poole. *Blast Furnace and Steel Plant*, v. 36, Jan. 1948, p. 76-82.

26b-7. Some New Developments in Steel. *Product Engineering*, v. 19, Feb. 1948, p. 135-136. Based on **New Developments in Steel**, by M. A. Grossmann.

Presented before local chapter of A.S.M., Des Moines, Iowa.

26b-8. Ferrous Physical Metallurgy. M. Baeyertz and W. F. Craig, Jr. *Mining and Metallurgy*, v. 29, Feb. 1948, p. 114-117.

1947 developments in mechanical properties; tranformations; quenching and heat flow; magnetic and electrical properties; and corrosion.

26c—Nonferrous

26c-2. Metallic Titanium is Light, Strong, Durable, and Corrosion Resistant. E. A. Gee, J. R. Long, and W. H. Waggaman. *Materials & Methods*, v. 27, Jan. 1948, p. 75-78.

Supply situation, manufacturing methods, properties, and present potential uses.

26c-3. Copper and Copper Alloys; a Survey of Technical Information During 1947. E. Voce. *Metallurgia*, v. 37, Dec. 1947, p. 80-84.

58 references.

26c-4. Copper Metallurgy. F. M. Shepard. *Mining and Metallurgy*, v. 29, Feb. 1948, p. 95-96.

1947 developments in production methods.

26c-5. Nonferrous Physical Metallurgy. Walter R. Hibbard, Jr. *Mining and Metallurgy*, v. 29, Feb. 1948, p. 118-126, 155.

Fundamental research developments of 1947 under the headings: effects of temperature; dislocation theory; plastic deformation; grain-boundary effects; mechanical straining; age-hardening; light metals; diffusion; gases in metals; recovery, recrystallization, and grain growth; and constitution.

26c-6. Copper and Copper Alloys; A Survey of Technical Information During 1947. E. Voce. *Metallurgia*, v. 37, Jan. 1948, p. 141-145.

Corrosion and protection; powder metallurgy; joining; electroplating and finishing; physical metallurgy and testing; scrap and industrial waste. 115 ref.

(Turn to page 62)

MANUFACTURERS' LITERATURE

Use the Handy Coupon to Obtain This Helpful, Free Literature

1. Aluminum Bronze

4-page colorful leaflet describes Ampcoloy 49, a new aluminum bronze cold heading alloy, available as rod and wire. Extrusion process gives superior grain structure. Bulletin contains chemical composition, physical properties, sizes, weights, tolerance and suggested uses. Ampco Metal, Inc.

2. Aluminum Cleaning

Timely article in Oakite News Service discusses the cleaning of aluminum for spot welding and painting, of protecting finished work against corrosion, and of obtaining smooth, lustrous finish. Article describes production procedures. Oakite Products, Inc.

3. Annealing Cyclic

4-page bulletin 121 discusses cyclic annealing of forgings, wire, rod, stampings and castings. Ajax Electric Co.

4. Barrels, Drying

4-page illustrated leaflet gives complete information on steam-heated sawdust drying barrels and sawdust separators for fast and efficient drying of small parts before and after electroplating. Belke Mfg. Co.

5. Forgings, Nonferrous

Advantages to be obtained by using nonferrous forgings for many parts are given in February issue of Nonferrous Forgings Digest. Many parts are illustrated. Brass Forging Assn.

6. Furnaces, Melting

4-page illustrated leaflet describes an improved reverberatory melting furnace. Combustion is improved, lining life increased, fuel consumption decreased. Melts all types and kinds of metals. Sklenar Furnace & Mfg. Co.

7. Induction Contactors

New line of magnetic contactors for high frequency heating and hardening applications is described in new bulletin. Standard and optional features, along with sizes, are shown. Electric Controller & Mfg. Co.

8. Metal Cutting

4-page leaflet describes 14-inch band saw which features two to four times faster cutting and claims double output with 25% to 50% reduction in operator fatigue. Construction and operation of saw are described. Boice-Crane Co.

9. Metal Spraying

Pictorial articles featuring savings in time and money effected by the metal spraying process is included in January issue of Metco News. New metallizing gun is introduced. Metallizing Engineering Co.

10. Metals, Painting

Pictorial article featuring savings by treatment with Deoxidine, phosphoric acid metal cleaner and rust remover discussed in leaflet. American Chemical Paint Co.

11. Pipe, Stainless

Tables showing properties of most commonly used types of stainless steel, displayed for easy reference, are featured in new 8-page bulletin describing stainless steel pipe, tubing and fittings. John B. Astell & Co.

12. Piping, Stainless Steel

New booklet "Stainless Steel Piping—Why and Where to use it", deals with five major reasons for use, various types, fabrication. Tube Turns, Inc.

13. Polariscopes

Bulletin 143-74 on photoelasticity polariscopes describes apparatus used for obtaining experimental solutions to problems of stress distribution in mechanical parts and structures. Gaertner Scientific Corp.

14. Rubber Products

6th edition "Manhattan Rubber Products for Industry" describes many mechanical and special items. Tank linings and abrasive wheels are covered. Raybestos-Manhattan, Inc., Manhattan Rubber Div.

15. Sapphire, Industrial

8-page booklet gives information regarding uses and properties of industrial sapphire, said to be harder than hardest steels. Sapphire Products Div., Elgin National Watch Co.

16. Stainless Steel

36-page handbook simplifies selection of the right stainless steel. Compares qualities, characteristics, uses, mechanical, physical, electrical, magnetic, heat resisting and corrosion resisting properties. Extensive technical data in form of graphs, charts and tables. Alloy Metal Wire Co. Inc.

17. Strain Amplifier

New strain amplifier for use with direct-inking oscillograph gives immediate chart records of strains with the SR-4 strain gage. Brush Development Co.

18. Welding Control

General products catalog includes illustrated description of several controls for resistance welding. Raytheon Mfg. Co.

19. Welding Products

28-page welding products bulletin is complete treatise on how to keep equipment of all types operating and producing through conservation welding. Photographs, drawings, and descriptions explain the low-cost method of keeping parts by repairing, rebuilding, reclaiming and hard surfacing with welding rods and electrodes. Ingenious shortcuts are illustrated. American Manganese Steel Div., American Brake Shoe Co.

20. Weldments

12-page illustrated booklet shows many examples of weldments. Features advantages of welded construction including rigidity, lightness, economy, predictability, facility of changing design, individuality, beauty of contour. United Welding Co.

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26d—Light Metals

26d-2. Magnesium and Its Alloys; a Review of Technical Progress During 1947. R. G. Wilkinson. *Metallurgia*, v. 37, Dec. 1947, p. 85-90.
14 ref. (To be continued.)

26d-3. Magnesium and Its Alloys; a Review of Technical Progress During 1947. R. G. Wilkinson. *Metallurgia*, v. 37, Jan. 1948, p. 133-136.
73 references.

27a—General

27a-22. Research in Action. Edition 2. 59 pages Battelle Memorial Institute, Columbus, Ohio.
Illustrated brochure describes Battelle's research activities in minerals beneficiation; fuels and combustion; metallurgy; ceramics; chemistry; physics; agriculture; graphic arts; production research. Also outlines Battelle's founding, organization, development, mode of operation, functions of the service departments, wartime research, future prospects, and activities in fundamental research and research education.

27a-23. Theory of Limit Design. J. A. Van Den Broek. 144 pages. 1948. John Wiley and Sons, Inc. 440 Fourth Ave., New York 16, N. Y.
The theory of elasticity and the theory of limit design are both used at present. The author claims that the former involves numerous assumptions which are little more than wishful thinking. The latter theory supposes ductile or semi-ductile stress distribution.

27a-24. Encyclopedia of Chemical Technology. Vol I. Raymond E. Kirk and Donald F. Othmer, editors, 982 pages. 1947. The Interscience Encyclopedia Inc., 215 Fourth Ave., New York 3, N. Y. $20.00.
This work is neither a dictionary nor a handbook, nor is it a series of technological monographs for the benefit of advanced specialists. Rather it is designed to present the entire field of chemical technology. The subject matter is descriptive of technologically important matrials, methods, and phenomena. It is not primariy theoretical and mathematical, except insofar as such treatment is necessary to bring out well-established principles and to provide background. The bibliographies are not exhaustive but are intended as selected reading lists. In presenting each subject, the aim is to give a balanced account excluding controversial or hypothetical material. The articles were written by authorities in each field and have been reviewed by one or more specialists. This volume covers "A to Anthrimides". The coverage is very broad, including, for instance, metallurgy, ceramics, fuels, lubricants, plastics and rubbers, coatings and many other subjects.

27a-25. Principles and Practice of Heat Treatment. J. Winning. Edition 2. 108 pages. 1945. Emmott & Co., Ltd., 31 King Street West and 21 Bedford St., Strand, London, W. C. 2, England.
Equipment and processes for thermal treatment of carbon and alloy steels, stainless and rustless steels, and nonferrous alloys.

27a-26. The Plater's Handbook. R. Cruickshank Ltd., London, England. 135 pages.
Various processes used in electroplating and much information of a practical nature. The information given is not confined to proprietary materials. A comprehensive chapter on the analysis of solutions.

27a-27. The Motor Industry Research Association; Second Annual Report. 59 pages. Oct. 1947. The Association., Great West Road, Brentford, Middlesex, England.
Summary of research programs on: Stresses in vehicle structures; stiffness of vehicle structures; filtration of libricating oil; bearing materials; gears; fatigue strength of crankshafts; exhaust-valve and cylinder-head temperatures; operation of engines on leaded fuels; design and positioning of piston rings; application of electrical strain gages; deep-drawing of sheet metals; fuel injection in spark-ignition engines; and piston ring flutter.

27a-28. Handbook of Horizontal Boring, Drilling, and Milling Machines and Their Application. 266 pages. Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. $5.00.
Complete information on horizontal boring, drilling, and milling machines including their construction, fields of application, operation, and productive possibilities. In loose-leaf form in order to permit later information to be added.

27a-29. 1946 Car Builders' Cyclopedia of American Practice. Roy V. Wright. Edition 17. 1444 pages. 1946. Simmons-Boardman Publishing Corp., 30 Church St., New York 7, N. Y.
Railroad and industrial cars, their parts and equipment; cars built in America for export to foreign countries; descriptions and illustrations of shops and equipment employed in car construction and repair.

27b—Ferrous

27b-8. The Enameler's Dictionary. 84 pages. 1947. Ferro Enamel Corp., 4150 E. 56 St., Cleveland, Ohio. Free on request.
Besides brief definitions of terms used in enameling, an appendix of useful tables.

27b-9. Hot-Dip Galvanizing Practice. William H. Spowers, Jr. Edition 2. 188 pages. 1947. Penton Publishing Co., 1213 W. 3rd St., Cleveland, Ohio. $6.00.
A fundamental study including varied applications. 346 ref.

27b-10. Transactions of the American Institute of Mining and Metallurgical Engineers. v. 167, Iron and Steel Division, 1946. 799 pages. 1947. The Institute, 29 West 39th St., New York 18, N. Y.
Technical papers, discussions and symposia presented at meetings held Cleveland, Oct. 16-18, 1944; New York, Oct. 25-26, 1945, and Chicago, Feb. 25-28, 1946; also the Howe Lecture scheduled for the New York Meeting, Feb. 1945, which was canceled. The papers have appeared in *Metals Technology* and have previously been abstracted from that source.

27b-11. Directory: Iron and Steel Plants—1948. 461 pages. 1947. Steel Publications, Inc., 108 Smithfield St., Pittsburgh 30, Pa.
Lists companies and officials of operating blast furnaces, steel plants, rolling mills, by-product coking plants, structural steel plants, and boiler and tank shops in the U. S. and Canada.

27b-12. Institute of Scrap Iron & Steel Yearbook. 98 pages. 1947. The Institute. 1536 Conecticut Ave., Washington 6, D. C.

27b-13. Steel Products Manual. Section 1—Pig Iron and Ferro-Alloys. Section 3—Tie Plate Designs and Punchings. Section 7—Alloy Steel Plates. Section 12—Hot Rolled Carbon Steel Strip. Section 19—Railway Track Materials. 34, 20, 60, 125, and 152 pages, respectively. Oct. 1947. American Iron and Steel Institute, 350 Fifth Ave., New York.
Revised sections of looseleaf handbook devoted mainly to specifications, standard manufacturing and testing procedures, properties and compositions.

27b-14. Metallurgy of Pig Iron. Vol. II. The Blast-Furnace Process. (In Russian.) M. A. Pavlov. 492 pages. 1945. State Scientific-Technical Publishing House for Ferrous and Nonferrous Metallurgy, Moscow, Russia.
Results of a thorough study of the theory of blast-furnace operation. Details of the most modern methods used in the solution of theoretical and practical problems. 268 ref.

27b-15. The Metallurgy of Steel Welding. British Welding Research Assoc., 29 Park Crescent, London, W. 1, England. 15s.
Papers and discussions at the Symposium on the Metallurgy of Steel Welding, held during Oct. 1945. There are three broad divisions in subject matter: Weld Metal, Hardened-Zone Cracking, and Current Researches.

27b-16. Nonmetallic Inclusions in Steel. M. Baeyertz. 135 pages. 1947. American Society for Metals, 7301 Euclid Ave., Cleveland, Ohio. $3.00
The nature and origin of the common types of nonmetallic inclusions, and a few of the methods that may be used to study them. It is not a complete coverage of the subject, nor a history of the development, but rather an introductory text for the beginner.

27c—Nonferrous

27c-2. British Non-Ferrous Metals Research Association; Twenty-Seventh Annual Report. 45 pages. 1947. The Association. Euston Street, London, N. W. 1, England.
General report, review of research progress, researches in progress, reports available, and membership information.

27c-3. Developments in Rubber. Andre Rubber Co., Ltd., Kingston By-Pass Surbiton, Surrey, England.
Consists of following series of articles and papers resulting from work done in the laboratories of the publisher, and reprinted from various British journals: Works of the Andre Rubber Company, Ltd.; Bonding of Rubber to Metals, by S. Buchan; Physical Examination of Brass Deposits, by S. Buchan and W. D. Rae; Chemical Nature of the Rubber-to-Brass Bond, by S. Buchan and W. D. Rae; Study of the Rubber-Metal Bond, by S. Buchan and W. D. Rae; Bonded Rubber for Machinery Mountings; Rubber in Electroplating, by S. Buchan; Rubber and the Mining Engineer, by S. Buchan; Testing Methods for Metals-Bonded Rubber, by S. Buchan; Mastication and Rate of Setup, Part II, by S. Buchan; Calculations Relating to the Goodrich Flexometer,
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This interesting book on physical metallurgy is based on a series of lectures presented during the 1947 National Metal Congress and Exposition. Prof. Mason points out that within the present generation scientific knowledge of metals has grown enough so that we can begin to understand what goes on inside them, and why they behave as they do. This is the field of physical metallurgy.

It is up to the worker with metals to follow what's new as well as to understand what's old, and this book helps the reader to do just that. General principles and behavior that are common to many metals are summarized. Knowledge of the alloys of one metal frequently applies to those of another, and as Prof. Mason says, "it won't hurt any 'brass' man to learn a little about alloys that aren't yellow, particularly since metals are so often in competition with each other."

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Nature and formation of metal crystals — extractive metallurgy; crystalline nature of metals; dendritic and columnar structures in cast metal . . . Alloys as solid solutions — properties of solid solutions; freezing of solid solution alloys; coring; limits of solid solubility . . . Working and annealing of metals — elastic and plastic deformation; work hardening, fatigue and creep; annealing and recrystallization . . . Unmixing of solid and liquid solutions — age or precipitation hardening; aluminum alloys; eutectic alloys; structural composition from phase diagrams . . . Solid solution in brasses and bronzes — "Alpha" alloys; intermetallic compounds; geometrical precipitation; peritectic reactions . . . Iron and steel — polymorphic transformations; eutectoids; structural changes with temperature . . . Heat treatment of steels. Cast Irons—quenching and tempering; alloy steels; white, malleable, and gray cast irons . . . Corrosion — electrochemical reactions; couple action; hydrogen ions and oxygen in corrosion.

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by Ralph F. Reynolds; and New Methods of Molding, by S. Buchan. Most of these were previously abstracted at the time of their original publication.

27c-4. 1947 Supplement to Book of A.S.T.M. Standards Including Tentatives. Part 1-B. Non-Ferrous Metals. 319 pages. 1947. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.

27c-5. The Plating of Zinc Alloy Die Castings. 132 pages. Machinery Publishing Co., Brighton 1, England. 7s 6d.

Various plating methods. Full directions on the composition and maintenance of the various baths used. Methods of testing the adhesion and thickness of the coatings. Reference to plating literature, a flow sheet showing the sequence of operations, and an index.

27c-6. Copper and Copper Alloy Springs. 62 pages. Copper Development Association, Grand Buildings, Trafalgar Square, London, W. C. 2.

Design, manufacture, and characteristics. 74 ref.

27d—Light Metals

27d-3. Magnesium Alloy Handbook. F. A. Hughes. 224 pages. Magnesium Elektron, Ltd., Abbey House, Baker St., London, N. W. 1, England. 25s.

Specifications and properties, methods of fabrication, applications, and other information on magnesium alloys. A section deals with the comparatively new zirconium-containing, alloys of high proof stress ratio.

27d-4. Aluminum and Its Alloys. N. F. Budgen. Ed. 2. 363 pages. 1933. Sir Isaac Pitman and Sons, Ltd., Pitman House, Parker Street, Kingsway, London, W. C. 2. England. 25s.

Original purpose of this book—presentation of a popular description of the subject for the semi-technical reader—has been maintained. The subdivisions are presented in a natural order—occurrence, production, properties, heat treatment, melting and alloying, casting, fabrication, working, welding, corrosion surface treatment, and industrial applications. Includes 150 illustrations, several tables, an inset map of Europe showing the location of the principal reduction works in 1940, and references following each chapter.

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Detroit Chapter Announces Spring Lecture Series

The spring educational series of the Detroit Chapter A.S.M. was announced at the February meeting by O. W. McMullan of Bower Roller Bearing Co., Educational Committee vice-chairman.

The program will consist of the following three lectures:

March 22—The Influence of Metallurgical Factors on Mechanical Properties of Steel, by S. A. Herres, Battelle Memorial Institute.

March 29—Residual Stresses From Heat Treatment, by W. J. Johnson, supervisor of applied mechanics, engineering division, Caterpillar Tractor Co.

April 5—Brittle and Ductile Failures of Metal, by Prof. W. P. Roop of Swarthmore College.

Uran Pinch-Hits With Account of Enamelware

Reported by M. E. Hansell
Rose Polytechnic Institute

When weather prevented the T.W.A. from transporting William Schneble of Advance Foundry Co. from Dayton to Terre Haute, Ind., for the local chapter's January meeting, no trouble was encountered in pulling a substitute for the scheduled speaker from the top hat. Kenneth Uran, production manager of the Columbian Enameling and Stamping Co., ably filled the bill with a good account of the manufacture of enamelware.

Mr. Uran opened with a history of his company and its product, followed by a chronological account of the manufacture of enamelware, which he decsribed as steel coated with glass. Materials for punches and dies were described, and the low-carbon, low-alloy steel discussed. Several novel fabricating and welding methods were revealed.

Mr. Uran also described experiences with stainless steel, and told how cooking utensils are copper plated on the outside bottom for better heat conductivity.

Ziv Has Toledo Branch

Ziv Steel & Wire Co. in Chicago has opened a new branch in Toledo, Ohio, with William P. Stead as manager. The company will stock all types of tool and die steels.

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● **HEAT TREATMENT OF METALS**. . . a Symposium

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● **ELECTRONIC METHODS OF INSPECTION**. . . a Symposium

This new book is based on a series of seven educational lectures on electronic methods of inspection presented during the 28th National Metal Congress. The book outlines some of the important developments that have resulted in the last ten years as a result of the tremendous increase in interest in strain measurements in material and structural testing. Experts in the metal industry also discuss spectrochemical analysis of metals, uses of the cyclograph for testing of metals, supersonic methods of metal inspection, determination of seams in steel by magnetic analysis equipment, the electron microscope and electronics in liquid steel. The book contains many references and a comprehensive index for ready use.

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● **METAL DATA SHEETS**

This is a complete collection of 150 data sheets originally published in Metal Progress. Widely used in industry, these data sheets are now available in loose-leaf form on 8½ x 11 sheets, collected in an attractive folder for file reference. Each data sheet has been revised and a cross index of the entire contents is printed on the file folder. General scope of these data sheets includes physical-metallurgical data . . . forging . . . steel—compositions, structure, hardenability . . . machinability . . . heat treatment—quenching, tempering, annealing, carburizing . . . corrosion resistant steels and alloys . . . heat resistant steels and alloys . . . nonferrous metals—copper, zinc, nickel, aluminum, magnesium . . . electroplating . . . welding.

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